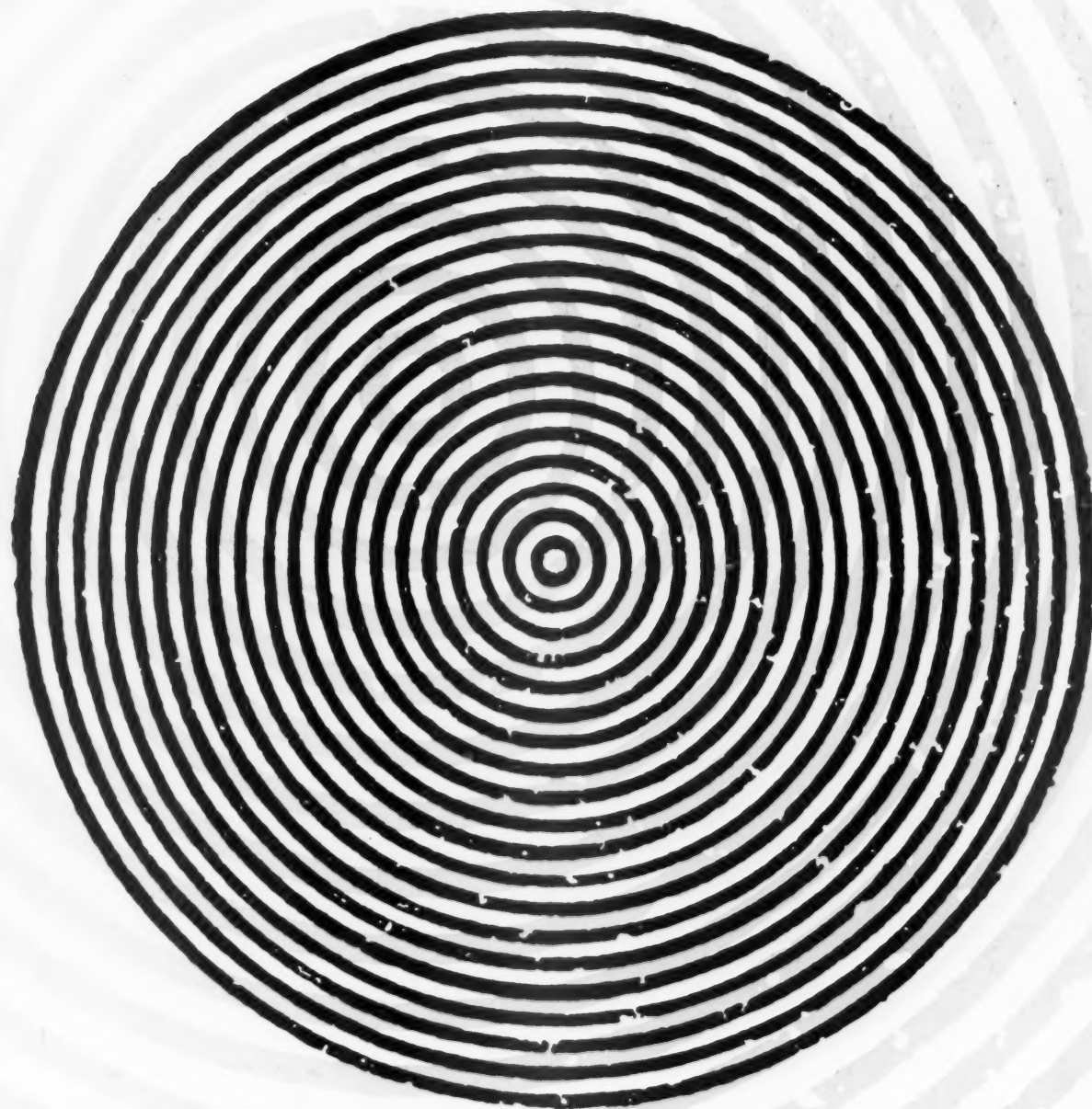


ARCHITECTURAL & ENGINEERING

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September 1959 Volume 1 Number 9



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ARCHITECTURAL & ENGINEERING NEWS



In this issue, emphasis is placed on engineering human comfort by means of mechanical design. The cover design by Tony Palladino utilizes concentric circles to symbolize the characteristics of radiation. Mr. Palladino is our guest designer this month. He is soon to be represented in the Museum of Modern Art's graphic exhibition, "The Package."



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- 35 Editorial: once over lightly
- 2 Forecast: housing the elderly
- 7 High velocity systems
- 11 Engineering human comfort
- 3 Gazette
- 4 A/E news
- 15 Products, equipment, materials
- 27 Preview: 9/ Bishop Towers co-op housing
- 29 Literature
- 34 Documents
- 35 Communications
- 36 Abstracts: Samuel T. Hurst, AIA
- 37 Books: aluminum construction manual
- 37 Names: David B. Steinman, PE
- 39 Digest: 9/ structural fastening, part 2
- 41 Calendar
- 40 Index to advertisers
- Readers service cards
- facing pages 8 and 32

forecast

FEDERAL HOUSING AIDS FOR THE ELDERLY

Excerpted remarks by E. Everett Ashley, III, Director of The Statistical Reports and Development Branch, Housing and Home Finance Agency, presented at the 11th Annual Conference on Aging, University of Michigan at Ann Arbor.

The problem and its origin

"Grow old along with me!

The best is yet to be,

The last of life, for which the first was made."

In 1864 when Robert Browning wrote these words in the poem *Rabbi Ben Ezra*, most thoughtful people no doubt regarded them as a bit of poetic license.

Where, they could ask, was this good life for the elderly? Average life expectancy was only around 40 years. In the United States fewer than 3 per cent of the people were as old as 65! Growing old in the present day sense of the word was indeed a rarity, and for the few who did reach the ripe old age of 65, the outlook often was bleak and discouraging.

For those who had not amassed or inherited wealth, there were no pension plans or retirement programs to enable them to take life easy in their later years. The choices were either to continue working, despite failing strength and declining health, to look to relatives for shelter and support, or to go over the hill to the poorhouse. Retirement villages, specially designed housing for the elderly, or well-equipped geriatric hospitals were unknown. The almshouse and a few church supported institutions—often for "indigent aging and infirm females"—were about all there was to offer.

The antibiotics and the vast array of modern therapeutic drugs were unknown. For an old person pneumonia meant certain death and generally so did a broken hip. Arthritis and rheumatism were even crueler cripples and more frequent killers than they are today. For the hard-of-hearing there were no transistors to make possible hearing aids. In Rabbi Ben Ezra's day, a cupped hand behind the ear or an ear trumpet was the best there was to offer, and the best was not too good. Dental hygiene was not well advanced. Rare was the person to reach the advanced age of 65 with enough of his own teeth to eat a normal diet, and the dentures then available left much to be desired.

Thanks to the advances of medical science, waging an unrelenting and successful war on most of the fatal ailments of the past, we now find more and more people who not only achieve but enjoy their 65th birthday. In 1864, out of a total U.S. population of nearly 35 million

people, scarcely one million were 65 or older. By the turn of the century, the ratio of older persons had crept up to 4.1 per cent. By 1950, it had topped 8 per cent. Today, close to 15 million Americans, or better than one of every twelve in 170 million population, are over 65 and the ranks of the elderly are still growing.

By 1975, some 21 million, or nearly one of every ten, will be 65 years of age or older. Since the turn of the century, our total population has a little more than doubled. During the same span of years, our senior citizens have had better than a 3½ fold increase!

Federal Council on Aging

It was with the varied needs of all our older citizens in mind that the Federal Council on Aging was established to focus the efforts of more than a dozen departments and agencies of Government, among which is the Housing and Home Finance Agency, on the multitudinous problems of our senior citizens.

Housing aspect of the aging problem

The reason housing for senior citizens has become a problem is less attributable to the increasing number of older people in our population than it is to the changes which have taken place in our economic patterns. During the past 50 years or so, the United States has become progressively more a nation of town and city dwellers.

Since 1900, the number of non-farm families has soared from a little over 10 million to nearly 45 million, while the number of farm families has dropped to the lowest level since the 1890's. The farm as a social unit has always been one which had a role for the family members of all ages, and it was taken for granted that the shelter needs of the aging members of the family would be provided for.

The city dweller on the other hand has a different economic orientation. Far less frequently than on the farm is his livelihood a family undertaking in which all the members are essential to its success. The economic compulsion to stick together as a family unit, therefore, is less strong. Young men and women upon completing their schooling are much more prone to leave home and set-up for themselves. Moreover, the homes which they establish, while adequate for themselves and their children, generally are much too small to accommodate their parents as well. Consequently, if one or both parents are obliged to live with their children, the outcome is often not a happy one. Frictions develop, tempers become frayed, and a most unsatisfactory living arrangement results.

Until comparatively recently, however, a large share of the elderly had to put up with their lot when it became necessary for them to move in with their children,

for they could afford no other living arrangement.

Now, however, we are beginning to witness some change. Thanks to social security benefits, and to the growing number of pension programs in industry, progressively more of our senior citizens find themselves with some income, modest though it may be, when they reach retirement. This has had an important influence upon the demand for suitable accommodations, within their financial means, in which these older people could live either independently or communally instead of being obliged to live with friends or relations.

In short, the three components of the present pressing concern with the housing needs of our senior citizens are more old people, more city dwellers, more retirement income. It must be recognized, of course, that all people do not develop a housing problem just because they get old.

In fact, to be seen in their proper context, the aged and aging should be looked at not as a completely isolated group but rather as one segment of the total housing market. To the extent that we are successful in raising the entire level of housing quality, we are by the same token helping to reduce the magnitude of the housing problem among families as they age.

Need for different quarters

Actually many of the things which make it necessary for older people to seek different quarters are matters of poor design and location which younger occupants, being more alert and nimble, tend to overlook. The slippery floors, the fall-inducing door sills, the poorly lighted staircases, the lack of grab-bars in the bathroom, the lack of toilet facilities on the first floor, the inaccessible storage space which is accepted as a matter of course by families in their thirties, their forties, and even their fifties, often become serious problems in their sixties and seventies.

At the present time, largely through the various Federal housing programs, the *FHA*, *VA*, and *PHA*—we are measurably improving the design standards of new dwelling units being built today. Eliminating the incipient hazards in the dwellings being added to the inventory gradually lengthens the numbers of years during which individuals can maintain themselves in their own homes.

[There will still continue] to be many older persons who need and will continue to need help in securing suitable quarters in their retirement years.

Review of the problem

In its broadest perspective, the problem of housing the elderly has many facets requiring special treatment. Here was a group of small households—predominately one and two person groups—

with far less than average incomes, many with some physical disabilities which set specific limitations upon the type and location of living quarters which would be suitable.

No one approach could meet the diverse housing needs of the elderly . . . The *Housing Act of 1956* (Public Law 1020, 84th Congress), enacted into law August 7, 1956, contains three main provisions to:

1. facilitate the purchase of housing by older persons
2. facilitate the financing of rental housing projects designed specifically for the elderly, and
3. make public low-rent housing more readily available to older persons.

To augment the benefits to the elderly contained in the Housing Act of 1956, the *FHA* also made significant revisions in the regulations governing its trade-in program, to facilitate the acquisition of homes better suited to their needs by present elderly home owners.

The Congress, in its 1958 session, had under construction further modifications of law providing Federal assistance to produce suitable housing for the elderly.

Single family home financing

. . . A big frustration of many older persons has been their inability to finance the purchase of a house better suited to their retirement needs than the quarters they currently occupied. Understandably enough, many lenders have been reluctant to deal with oldsters because of their relatively short life expectation, low incomes and greater vulnerability to financially catastrophic illness.

The Housing Act of 1956 took steps to break this roadblock and open up the possibilities of home financing to many of our older people who had previously been turned down. The National Housing Act was amended to make it possible for friends or relatives, or even a corporation, to make the down-payment on a house being purchased by a person 60 years of age or over.

In those cases where merely obtaining the down-payment from a third party is not enough to swing the deal, still further relief is available under the Act. Where an elderly person because of either age, physical condition or financial position is unable to qualify as an acceptable mortgage risk, it is permissible for a third party to become a co-signer of the mortgage. In this way, for example, a son or a daughter can, by going on the note with an elderly parent, assure the financial acceptability of the older person to a lending institution. The one restriction which the law imposes is that the aggregate amount of the mortgage insured by *FHA* and any uninsured loan, in connection with the downpayment, shall not be in excess of the *FHA* appraised value of

(Continued on page 38)

gazette

Appointment of Dr. George J. Resinkoff as Director of Industrial Engineering at Illinois Institute of Technology becomes effective September 1, 1959. He has formerly served as acting director of the department.

Dr. Stothe P. Kezios, Professor of Mechanical Engineering and Director of the Heat-Transfer laboratory at the Illinois Institute of Technology, has been elected Chairman of the Chicago section of the American Society of Mechanical Engineers.

Honorary membership in the American Society for Testing Materials was awarded to Douglas E. Parsons, Chief, Building Technology Div., National Bureau of Standards.

Richard A. Kimball, AIA, of the New York Chapter AIA, has been appointed Director of the American Academy in Rome, effective January 1, 1960.

T. Cortlandt Williams, President of Stone & Webster Engineering Corp., has announced election of four Vice Presidents. They are Harold F. Cleary, Donald N. McCord, M. H. Cutler and William R. Prang.

Ted B. Adsit, urban planner, administrator and educator, appointed Assistant Director of Planning of Welton Becket and Associates, Architects and Engineers, of Los Angeles, California.

Robert B. Aitchison, Consulting Engineer for Linde Co., Div. of Union Carbide Corp., will be awarded the John Price Wetherill Medal from the Franklin Institute at formal ceremonies Wednesday, October 21.

Paul T. Howard, of the Chemistry Div. of the National Bureau of Standards, has been awarded the U. S. Department of Commerce Silver Medal for Meritorious Service.

Joe B. Browder, Atlanta, Ga., elected President of the Illuminating Engineering Society, professional organization of U. S. and Canadian lighting engineers. Other national officers elected include James R. Chambers, Chicago, Vice President, and Charles W. McCormick, Berlin, Conn., General Secretary; G. Franklin Dean, Toronto, Ont., Canada, was re-elected Treasurer.

William Gillett, Vice President of Fenestra, Inc., reappointed Chairman of The Building Research Advisory Board. Serving second term as Vice Chairman is Richard H. Tatlow III, President of Abbot, Merkt & Co. Six new members also appointed to Board: Frederic M. Babcock, Frederic M. Babcock and Co.; Max Barth, Office of the Assistant Secretary of Defense, Department of Defense; Peter B. Gordon, Vice President, Wolff & Munier and President of the John B. Pierce Foundation; Raymon H. Harrell, Executive Vice President and Director of Research, Lumber Dealers Research Council; Dr. Ernest Weissmann, Assistant Director, Bureau of Social Affairs, United Nations; Thomas E. Werkema, Executive Research Staff, The Dow Chemical Co.



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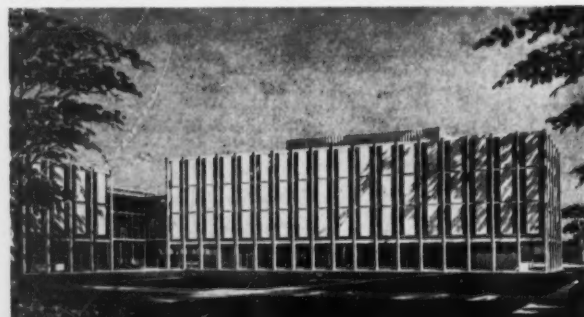
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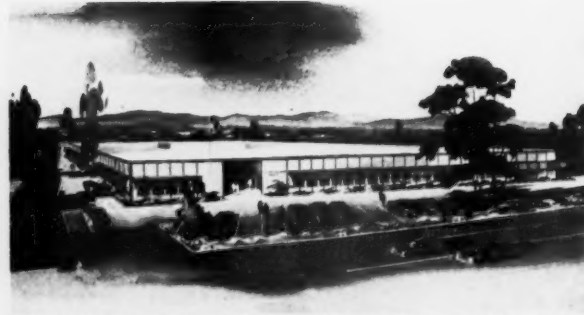
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\$1.36 million, 91-bed addition-alteration program for Cape Cod Hospital, Hyannis, Mass., (above) by White Plains office of Perkins & Will, Architects. (Rendering: Jacoby). Detroit's Wayne State University Science Building (below) will provide teaching and research facilities. Albert Kahn Associated Architects and Engineers with W. B. Sanders, AIA, Design Consultant.



The Graduate School of Business (above) proposed for Columbia University, New York City, at approximate cost of \$5 million. Architects: Moore and Hutchins, New York. (Rendering: Schwartz). First unit of proposed \$1.5 million Rensselaer Polytechnic Institute Science Center (below) at Troy, New York. Architects: Voorhees Walker Smith Smith & Haines of New York.



\$476,000 headquarters building, providing 36,000 square feet, (above) underway for General Telephone Co., Downey, Calif. Construction of \$1.8 million, 100-bed, circular addition to Valley Presbyterian Hospital (below) in Van Nuys, Calif., also announced by Charles Luckman Associates, planning-architectural-engineering firm of Los Angeles. (see West Coast report).



Halper Clinic, six-story building for medical and psychiatric research, of Mt. Sinai Hospital and Clinic, Los Angeles. Also announced by Welton Becket and Associates, Los Angeles Architects and Engineers is 22-story office building for Travelers of Los Angeles at estimated cost of more than \$15 million. 300-foot structure will have 452,000 square feet and adjoining parking facility for 825 cars.



TV salute

Architects and their contribution to the American scene will be the object of a special television tribute during opening moments of the *Armstrong Circle Theatre* presentation of Wednesday, October 14. The show will be seen at 10 p.m. (New York Time) on the CBS television network of 116 stations by some 20 million viewers.

West Coast report

Charles Luckman Associates, planning-architectural-engineering firm of Los Angeles and New York announces four new projects: A new Broadway department store in Whittier, Calif., scheduled to be under construction this fall, will represent a total investment in excess of \$6 million. The new store will occupy 17 acres in the Whittwood Shopping Center in a multi-level structure containing approximately 130,000 square feet. A 50-acre site has been acquired on the Palos Verdes peninsula for the construction of a major new research center for the Nortronics Division of the Northrup Corporation. The facility being planned by the Luckman office will be completed in the summer of 1960 at a cost of \$4 million. Construction of a 100-bed addition to Valley Presbyterian Hospital in Van Nuys, Calif., is scheduled to start early in 1960 at a cost of \$1.8 million and will provide a new four story, 51,000 square foot unit, circular in design, similar to the existing 63-bed, three story unit. (see photo). A new headquarters building for the General Telephone Company in Downey, Calif., is also under way. (see photo).

Welton Becket and Associates, Architects and Engineers of Los Angeles, announce three new projects. Plans are underway for the construction of a modern 22-story office building in the heart of the mid-Wilshire district of LA to provide facilities at a cost of \$15 million for the Travelers Insurance Companies. (see photo). Construction is under way on a new Missile Assembly Building at Vandenberg Air Force Base for the Atlas Intercontinental Ballistic Missile. The third new project of the Becket Office is the development of a six-story building for a medical and surgical out-

ae news

patient clinic and for medical and psychiatric research. The structure of reinforced concrete frame will provide 40,000 sq. ft. of area at a cost of \$840,000. (see photo).

Opaque aluminum panels finished with charcoal gray porcelain enamel, will distinguish the new California Bank Building in downtown Los Angeles. The new 18-story structure marks the first building exceeding 13 stories to be erected in Los Angeles since the repeal of a height limit restriction in 1956. Architects for the project are Claud Beelman, AIA, and Associates.

Research and studies

The *National Academy of Sciences-National Research Council*, a private body of distinguished scientists and engineers, has undertaken a special study of school fire safety, the organization's president, Dr. Detlev W. Bronk, announced. The study will be conducted by the *Building Research Advisory Board (BRAB)* with joint sponsorship of the Committee on Fire Research (CFR)—two Academy-Research Council groups—under a grant from Educational Facilities Laboratories, Inc.

Chief purpose of the project is to assemble, evaluate and publish information on the question of fire safety and its dual relationship to the economics of school structures and the educational needs of communities.

A committee, composed of individuals competent in the fields of education, architecture and engineering, fire protection, fire research, building research, codes, and school and municipal administration, has been appointed to assume responsibility for the conduct of the study, the organization of a summing-up conference this fall, and the later publication of an open report.

The committee is chaired by Norman J. Schlossman, AIA, a member of BRAB and a partner in the architectural firm of Loeb, Schlossman and Bennett of Chicago. Among other committee members is Charles T. Granger, Jr., AIA, a partner in the architectural firm of Fehr and Granger, Austin, Texas, who is Chairman of the AIA Committee on School Buildings and Educational Facilities.

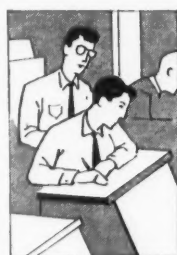
The *Building Research Advisory*
(Continued on page 6)



The
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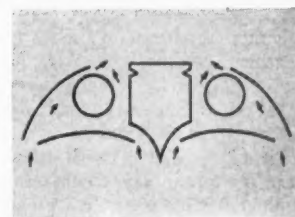
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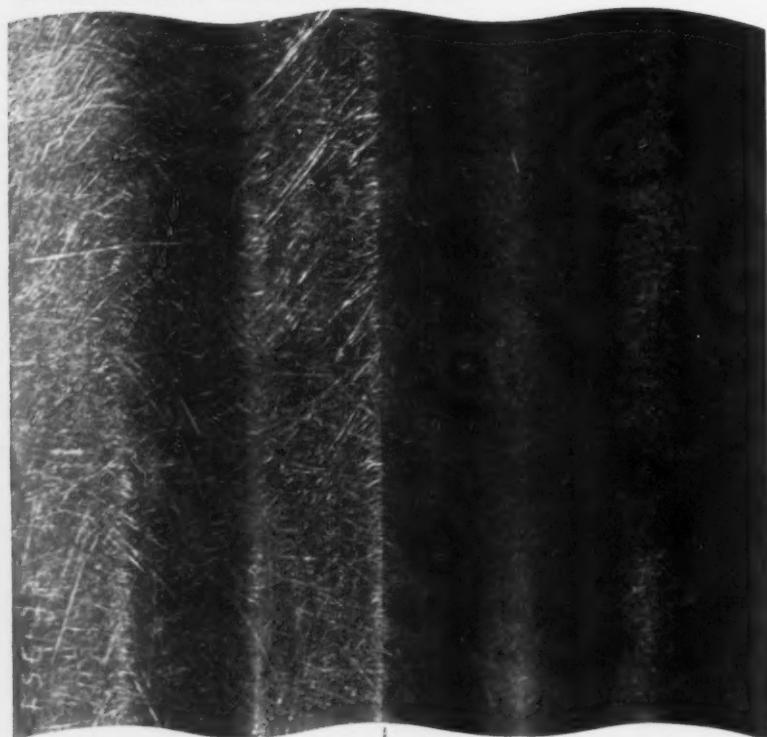
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Board, (BRAB), at the request of the Federal Housing Administration, has undertaken a nation-wide pilot survey to identify those areas of a house where scientific and technical knowledge may improve future home construction. Occupants of approximately 2,500 homes throughout the nation have been asked to tell BRAB of their experience with the performance of their house during the past year. An objective of the study is to establish statistically reliable factors for the evaluation of information obtained, and is preliminary to a proposed full scale study to be conducted at a later date.

At a conference held in Washington, D.C., 45 representatives of national groups recommended that the *American Standards Assn.* be asked to initiate a standards project that would make buildings used by the public and their facilities accessible to physically handicapped people. The association's approval of the recommendation would authorize setting up, under ASA procedures, a national standards committee representative of groups substantially concerned with the problem.

People in wheel chairs, the blind, and even people who walk with canes or crutches, often find it impossible to get up stairs, through revolving doors, and up self-service elevators in public buildings. At the request of the President's Committee on Employment of the Physically Handicapped, the ASA called the conference to see if the national groups concerned could agree to try and help solve this problem of the handicapped.

The meeting disclosed that specifications are needed for such things as stairs, doors, elevators, rest room facilities, drinking fountains and phone booths so that the handicapped will be able to use them. A draft guide aimed at overcoming some of these obstacles has been prepared, with the objective that national standards would be formulated. While the standards which could evolve from this new work would be voluntary, architects and owners of public buildings would be urged to incorporate their provisions wherever possible.

ae news

Education notes

The *John Crerar Library*, one of the world's largest collections of technical, scientific and medical literature, will move to the Technology Center campus of the Illinois Institute of Technology. It will be housed in a new building which will provide 80,000 square feet of space; its estimated cost is over \$1.5 million.

The Southern California Plastering Institute has just announced its second annual grant of four one-year scholarships to the *School of Architecture of the University of Southern California*. These scholarships have been awarded to two students entering the fourth year and two entering the fifth year courses in architecture at the University. Each scholarship is for \$1,200.

Among the 14 candidates nominated by the USC faculty, were the recipients: Miss Ena Dubnoff, Norman Lacayo, Tom Pagliuso and Gary Call. Their selection was based on academic achievement and professional promise.

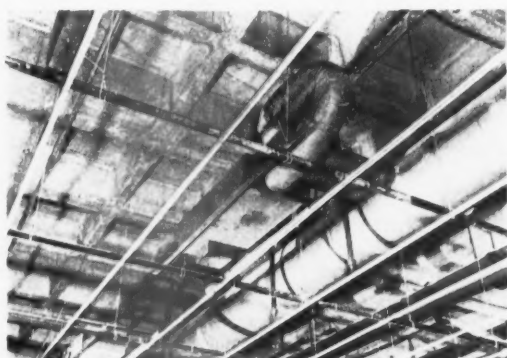
A new chemistry and chemical engineering building, at the Armour Research Foundation of *Illinois Institute of Technology*, will cost nearly \$3.5 million and provide a total area of 144,000 square feet. When completed, it will be connected to the mechanical and engineering research building. Architects for the project are the Chicago firm of Schmidt, Garden & Erikson.

The 1959 *National Institute for Architectural Education Thesis Award* of the \$50 prize offered by the *Société des Architectes Diplômés* and the *Nivola Trophy*, went to William J. Hess, Jr. of New Orleans, a candidate for a master's degree at Columbia University in New York. The subject of Mr. Hess' thesis was an "Urban Elementary School." Each year the *NIAE* invites the submission of theses from the nation's architectural schools and awards honors to those selected by a picked jury of architects. The purpose of the Thesis Award is to recognize and reward students who exhibit an understanding of the broader aspects of architecture and demonstrate their ability to solve an architectural problem.

HIGH VELOCITY SYSTEMS

by Dr. Nicola Ginzburg, PE*

High velocity systems as a means of air distribution influence architectural planning and construction. Dr. Ginzburg reviews key points of immediate interest to the architect in the utilization of such a system.



High velocity control units (above) mounted on channel bars attached to trunk duct with flexible ductwork. High velocity (below) double duct mixing unit. (Photos: Barber-Colman Co.)



The architect, generally speaking, has limited knowledge of the *actual requirements* of mechanical design engineering. He is quite conversant with *principles* and rudimentary applications but the very nature of the demands of his busy practice precludes his mastering the absolute requirements necessary to good air-conditioning practice.

The architect could and should know more about air-conditioning. The suggestion is made in all earnestness because in that way he can utilize the services of the mechanical engineering consultant more efficiently and more creatively.

Since air-conditioning deals with physics, it therefore has prescribed limitations. So if one provides only the barest minimum space requirements set by the engineer, the least—and perhaps the worst—that can happen is that the system is uneconomical. That is to say, that a system can be efficient but uneconomical.

This rather negative approach can be dispensed with if there is a recognition that the integration of the services of engineering consultants early in the architect's program is becoming an increasingly more indispensable one. In view of the newly established techniques of high-velocity air distribution systems of the past few years, the thinking of the mechanical engineer should be introduced as soon as the architect's programming will permit.

Although the initial cost of a high-velocity system is high, many economies may be affected in the client's over-all costs; a more compact system of air-distribution may be provided to suit contemporary architectural planning and aesthetics, and a system of greater physical comfort may be developed that can be more easily adapted to changed local conditions.

The high-velocity system offers advantages in multi-story buildings. In order to utilize this advantage, the architect, the structural and mechanical engineers must co-operate from the earliest stages.

With the present conventional system of low-velocity air distribution, one may find main duct work, at each floor of a high-rise structure, of fifteen square feet in cross-section. To accommodate this duct work adds considerably to the building cost.

The high-velocity system, on the other hand, makes possible a saving, roughly speaking, of one foot in height, for each story of a building. It would therefore be possible to gain an additional floor in ten stories of structure for a building of the same over-all height. It is equally apparent that basic architectural and structural planning and design can be affected by mechanical engineering design.

Therefore, the writer cannot stress too strongly

**Dr. Ginzburg is a Consulting Engineer in private practice in Philadelphia, Pa. He received his professional education at the Royal School of Engineering in Turin, Italy. He serves as consultant to American as well as European firms. He maintains a National Certificate of the NCSBEE and is registered as a professional engineer in seven states and is a member of ASHRAE, NSPE and the ASME.*

the need for basic and immediate cooperation at the inception of a project by the design professions.

In order to understand the architectural problems inherent in the use of a high-velocity system, it would be well to review some of its chief characteristics, requirements, differences and its applications.

Using the authoritative *ASHAE 1959 Guide*, we find the following definitions:

All-air high velocity systems

All-air high-velocity systems are air-conditioning systems in which the duct velocities and static pressures are such that special control and acoustic equipment is required for proper introduction of the conditioned air into the space to be served.

All-air high-velocity duct systems are of either single-duct or dual-duct types.

Single-duct types

The single-duct system is usually zone controlled. The supply temperature established for each zone and therefore variations in individual rooms must be compensated by throttling the air supply volume. Throttling is limited to the lowest air quantity required for ventilation and for satisfactory air distribution which depends to a large degree on the performance of the type of air outlet used.

Dual duct types

Dual duct systems deliver the entire air supply to cold and warm-air supply ducts, from which it is distributed into air mixing valves or acoustic terminal devices. (A mixing valve is a mechanical device that serves to proportion air from a cold-air and a warm-air duct into a common outlet or duct. An acoustic terminal device is an air distribution unit consisting of an air valve, acoustical attenuation chamber, and air outlet.)

The proportion of cold air and warm air delivered to the air-mixing valves or acoustic terminal device is thermostatically controlled. This control together with controls for maintaining fixed volumetric delivery, results in a constant volume of air supply at a temperature that satisfies the load.¹

Other characteristics

Other characteristics of the high-velocity system will be discussed in comparison with the low velocity or conventional air-distribution system. The high-velocity system is one in which the air velocity in the main duct varies from 2,500 feet per minute (fpm) to over 6,000 fpm. The low velocity system seldom goes above 1,500 fpm. In this system total static pressure (resistance to air flow) losses usually do not exceed 3". (The static loss is the friction loss through the duct system. Measurement of it is by noting the difference in pressure between two sections of a duct.) The pressure drop in a duct is caused by surface friction. This friction can be expressed in inches of water.

(Continued on page 8)

HIGH VELOCITY SYSTEMS

(Continued from page 7)

In primary-air high-velocity systems, it is not necessary to control static pressures in order to prevent static-pressure unbalance, because this system operates with constant air volume. In all-air high-velocity systems operating with variable air flow, some control of static pressures may be required in order to prevent static-pressure unbalance, which is a large deviation from design static pressure at the inlet of a terminal, caused by large deviations of air flow.²

As stated before, in the single duct high-velocity system, temperature controls are maintained by varying the amounts of flow of air or by varying the temperatures. With a variable air flow, unbalance can be caused in the system. Several means of correction for unbalance may be applied, by use of static-pressure controls on the dampers of the air-distribution system or by static-pressure controllers on the inlet vane of the fan. Zoning and changing air-supply temperature respond to changes of static-pressure in the single duct system. However, it has long been known that the best control can be achieved with a dual duct system (that is, in conventional systems, heretofore) which carries the cold air and the warm air although the system, in the past, has been extremely bulky in a low-velocity system. Now the advantages of the dual duct system can be realized utilizing a high-velocity method.

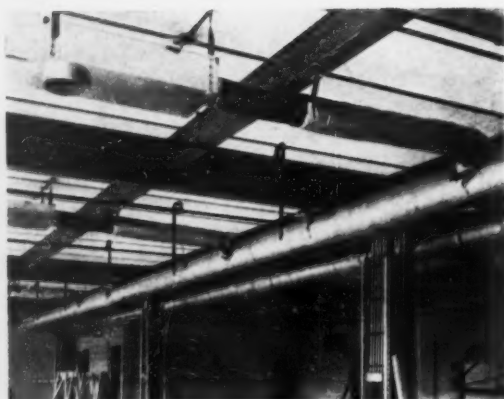
Fans and duct work

The design of high-velocity duct systems involves a compromise between reduction of duct size and the subsequent necessity for high fan horsepower.³ In the low-velocity system, ducts handling huge amounts of air present a problem with bulk and the concomitant problems of hanging and bracing. The fans of the low-velocity system are less expensive up to 2½" to 3". When this range of fan sizes is exceeded, the low-velocity type becomes a more expensive method of air-conditioning.

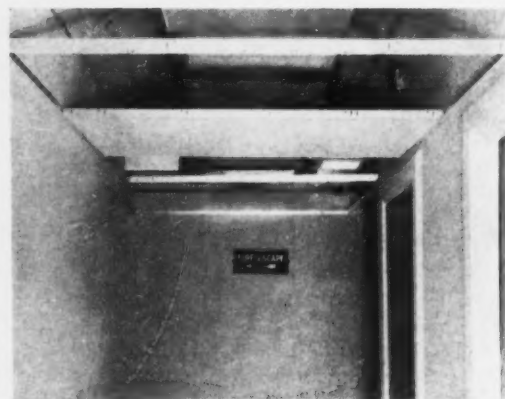
High-velocity system fans require variable inlet vanes and a subsequent increase in horsepower, as noted earlier, in order to overcome the tremendous increases in frictional resistance (static-pressure). The duct work of such a system is more expensive, although the duct sizes are considerably reduced. The workmanship must be very accurate and of first-class quality due to the fact that the system has to be air-tight. Round ducts are used whenever or wherever possible. Workmanship of the high-velocity duct type does not differ in essential features from the high-velocity industrial exhaust system.

Sound control

In the low-velocity system, the outlets do not require any sound attenuating device, although a recent conference on noise control of the *Building Research Institute*, (reported in *A/E News, Noise Control*, March 1959) discussed the problem of



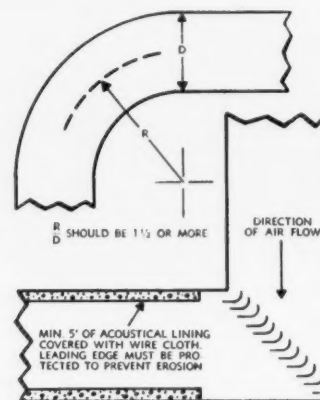
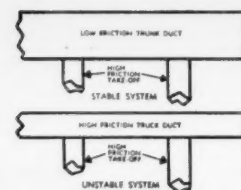
High flow velocity control units attached with flexible ductwork. (Photo: Barber-Colman Co.)



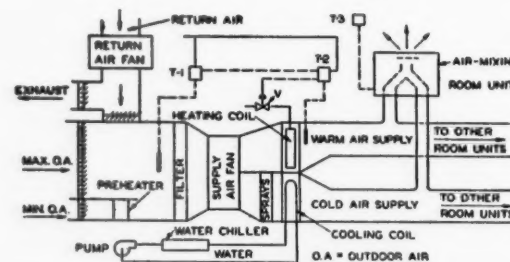
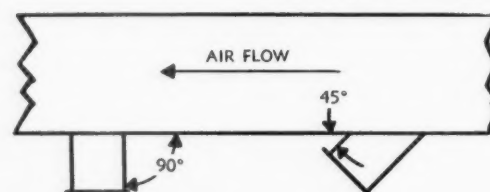
High velocity ductwork (above) installed in corridor of existing hotel. New suspended ceiling finishes installation. Typical sound absorbers (below) for use downstream from the fan. (Photos: Barber-Colman Co.)



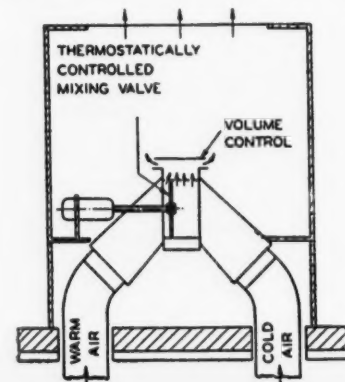
The stable air distribution system is similar to a city water system—not affected by changes in load requirements (illus: Barber-Colman Co.)



Long radius elbows are preferred, but square corners can be used if equipped with a specialized device for airtowns (above). The system design must take into consideration (below) the loss at 90° take-offs. (illus: Barber-Colman Co.)



Schematic arrangement of duct-duct system. (above). Room air-mixing unit (below) for dual-duct system. (illus: 1959 Heating Ventilating and Air-Conditioning Guide, Vol. 37, ASHAE, New York, N. Y.)



sound attenuation in low velocity systems.

In the high-velocity system, sound attenuation is necessary. Air leaks which occur on the ducts will create serious noise problems as well as bleed air into non-conditioned spaces. Noise will be controlled by mechanical means. Outlets of high-velocity systems always require some form of sound attenuating device.

One may have a system in which the main duct is high-velocity but the branches are low velocity. In such a case, the attenuation of noise is introduced at the junction of the main duct and the branch rather than at the outlet. In an all high-velocity system, each outlet has a sound attenuation control. This is where costs, in the opinion of the writer, skyrocket, in providing this measure of sound control. However, the advantages of space saving and the flexibility of the system must be weighed carefully and considered rather than the initial installation and fabrication costs.

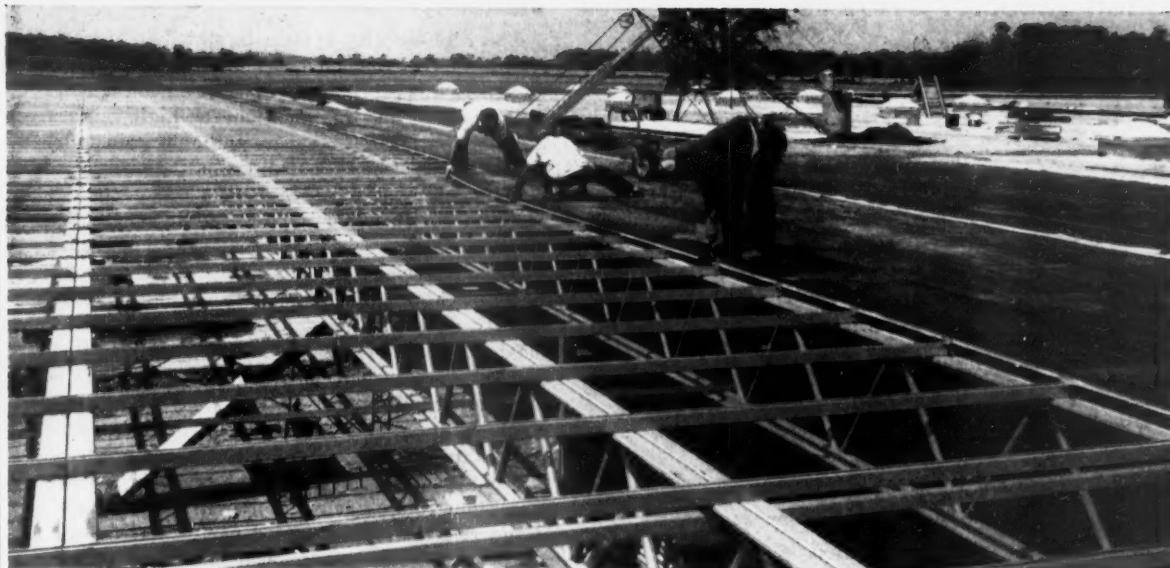
As stated earlier, the workmanship of ducts is important in the high-velocity type. It is also critical from the point of view of noise control. The quality of workmanship generally applied to high-velocity systems is adequate to prevent objectionable noise with the precaution noted above in protecting against air leaks. The adequacy of most high-velocity types is due to the use of the proper gauge of metal which must of necessity be heavier in this system for the same duct dimension that may be found in the low-velocity system.

An analysis of noise will reveal that it is due to (1) air noise and (2) equipment noise. Fan noise is attenuated in high-pressure fans by a special manner of construction using sound-deadening or lining materials which are utilized with high-velocity systems. This system invariably requires special fans built for this specific purpose.

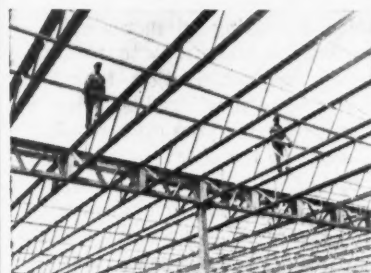
Controls

Conventional controls are applied to both systems with modifications necessary to the operation of the type of system involved. In the basic high-velocity system, the single duct utilizes zone control whereas the dual duct system uses a single fan having either zone control or individual room control. The single duct system is simpler and therefore less expensive. It is used for medium and small buildings, and sometimes in large buildings (where performance criteria are not too rigid). In systems of this character, the fluctuation in temperature of the primary air supply related to the outside temperature is compensated for by over-all zone control, and therefore differences in individual room load and occupant preference are affected by simple manual damper control of the air volume at the distributing unit. In such a system, it is necessary to have a pressure regulator in the main air supply so that the pressure within the system remains constant irrespective of the volume of air passing at any time. Controls can also be installed for the change over from winter to summer conditions.⁴

(Continued on page 10)



Every phase of the roof deck construction is illustrated in this view: Joists, box section sub-purlins, 2" Tectum plank, built-up roof, gravel coating.



Workmen are shown carrying several 34' long lightweight box sections in the initial phase of the job. The sub-purlins are aligned in position with precision jigs and then fillet welded at each joist crossing.



Welding at each joist crossing provides lateral strength and continuous beam action. Note weld is hidden from view below, by joist.



High speed clips are driven over tongue of plank. Tectum planks span three sub-purlins giving added lateral strength. This operation is quickly accomplished; saves time.

*Saved 50% on Sub-Purlins and Erection,
80% on Painting Costs with the*

NEW TECTUM® BOX SECTION ROOF DECK ASSEMBLY

Combining pre-painted bar joists, Tectum galvanized box section sub-purlins and factory-finished Tectum roof deck planks, eliminated 80% of normal painting costs for the interior of the new Scott Chemical Warehouse, Marysville, Ohio.

Other major savings were indicated by James Campbell, President, James Campbell Associates, Inc., Engineers and Builders. "We are extremely pleased with the speed with which the new Tectum roof deck assembly was completed. Tectum's new box section sub-purlins are light, easily handled and the space provided between joist and roof deck offers many economies in the hanging of pipe, conduit and other utilities. The new system is a time-saver from every standpoint and

the appearance is excellent."

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Building: Scott Chemical Company, Marysville, Ohio. Engineers & Builders: James Campbell Associates, Inc., Marysville, Ohio. Tectum Erector: Bard Roofing & Sheet Metal Co., Columbus, Ohio.



The finished deck is clean, light reflective and maintenance free. Tectum insulates, absorbs sound, is structural and noncombustible in accordance with Federal Spec. SS-A-118b.

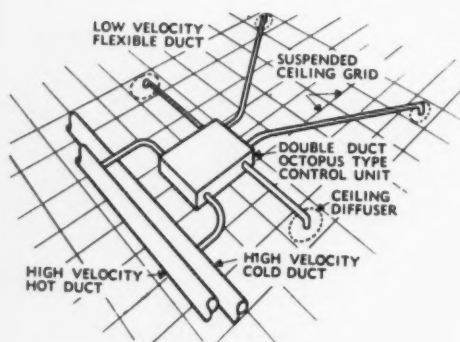
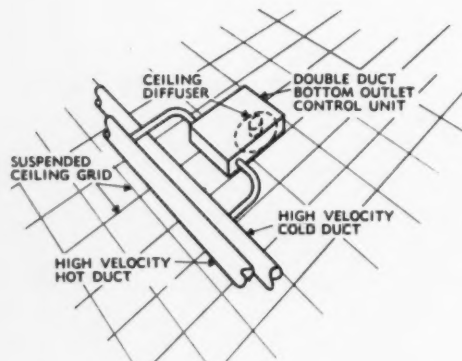
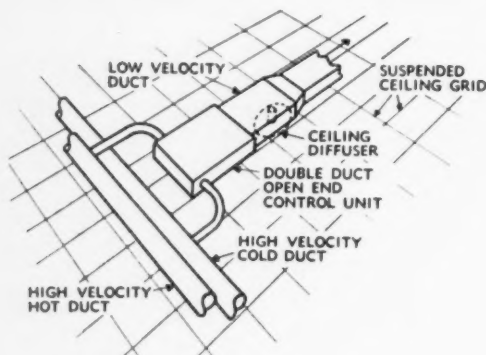


In this close-up, the facility with which the sprinkler system was erected indicates a typical time saving advantage of the new Tectum roof deck assembly. An estimated \$3000 was saved on the erection of the sprinkler system.

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HIGH VELOCITY SYSTEMS

(Continued from page 9)



Double duct open end control unit (top) mounted above suspended ceiling. Double duct control unit (center) with diffuser mounted on bottom of unit. Double duct octopus (bottom) type control unit mounted above suspended ceiling. Note: Sketches (courtesy: Barber-Colman Co.) show double duct control units. Single duct control units would be the same, but the high velocity hot duct and runout to control unit would be eliminated. On single duct systems use 45° take-offs instead of 90° take-off shown. Sketches are applicable for control units with or without self-contained constant volume regulation.

Flexibility

The high-velocity system is stated to provide flexibility over the conventional system. To many designers this represents a distinct advantage and provides sufficient justification for high velocity air distribution if that were the only gain from its use.

Comparison of the high-velocity system is made to a city water supply system where, by simply opening a faucet, the necessary flow occurs without materially disturbing the balance of the system. This can be accomplished in the high-velocity duct type providing that the design of the ducts takes advantage of static regain so that the static-pressure drop throughout the system is relatively small.

One manufacturer of components of such a system points out that, frequently, the use of space in a building changes, and the air volumes required must necessarily be altered. For example, if the relatively quiet rug department in a department store is transformed into a toy center where there is considerable activity and heat gain, this gain can be easily taken care of by simply opening the air valve, providing an increase in the flow of air. Frequently, it is desirable to install more diffusers because of (anticipated) tenant changes; this can often be accomplished by using a flexible duct and attaching it to the main trunk with a minimum change in the sheet metal system. Another form of flexibility, attained by using flexible ducts to connect the sound attenuator box to the main trunk, has proven to be a valuable feature. In a large shopping center, the specifications called for a seven foot length of flexible duct connecting each of the high velocity control units to the main duct. These units could then be moved through this radius to take care of changes in occupancy load. During the construction of the building, the acoustic ceiling was found to have expanded slightly so that many of the light fixtures and sprinkler heads were not properly centered in accordance with the plan. These fixtures had to be relocated, requiring considerable effort, while the sheet metal contractor simply moved the sound attenuator box by sliding it along the channel bars it rested on until properly located.⁵

Building applications

Older buildings: in older buildings where the owners are finding it increasingly difficult to protect their investment due to the loss of tenants and the subsequent decrease in rental revenues, the buildings have been "up-dated" by air-conditioning. The use of a high-velocity system is preferable because here is where the greatest economy can be extracted in the use of a special air-conditioning system. The high-velocity system has proven itself to be the least expensive solution for older buildings.

In multi-room buildings, the writer recommends a system of air-conditioning utilizing a combination of chilled-water fan-coil units for the perimeter of the building and a high velocity system for interior rooms.

In office and other high-rise buildings there is, in the opinion of the writer, a "stand-off" condition in the economical use of a high-velocity system *vs.* a conventional system. In determining the optimum condition under which a high-velocity system would be selected, a rule-of-thumb may be employed before an elaborate cost analysis could be undertaken. A given floor-to-floor height (in inches) is divided by 18" (representing the width of insulated duct.) The product, of course, is a number, which if it is seven (7) or greater, a high-velocity type is feasible. If less than seven (7), (representing the number of floors in the proposed building), a high-velocity system is not recommended. Prudence and professional discretion must, of course, be employed in the use of the rule-of-thumb which may be illustrated as follows:

$$\frac{10' \text{ (average fl. to fl. hgt.)} \times 12'' \text{ (120'')}}{18'' \text{ (representative insul. duct)}} = \text{number of floors}$$

Apartment buildings

In the writer's opinion, the high velocity system is not suited for apartment buildings (as they are generally planned today). A system that is appropriate is the medium pressure conduit-weathermaster which is produced by several manufacturers. In most cases, the least expensive system would be the use of fan coil units with dual service for piping hot and chilled water. The only interior rooms generally found in apartment buildings are the kitchen and the bath, both of which can be inexpensively mechanically exhausted.

Conclusion

The high-velocity system has genuine advantages over conventional types, however it should be applied only where the low-velocity system is uneconomical. A high-velocity system is more demanding on consulting engineers not only in design and supervision, but also in pursuing testing procedures for materials and the system of acoustical treatment. Finally, care must be given to specifications that encompass the specific sound attenuation and auxiliary problems associated with high-velocity systems.

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1. ASHAE Heating, Ventilating and Air Conditioning Guide, New York: 1959 Edition, vol. 37., p. 236.
 2. *Ibid.*, pp. 296-297.
 3. *Ibid.*, p. 296.
 4. Engineering, High Velocity Air Conditioning Permits Building Economy, London: Jan. 30, 1959, p. 158.
 5. Barber-Colman Co., informational brochure, p. 5.
- Illustrations and photographs courtesy of the Barber-Colman Co. of Rockford, Ill. and the American Society of Heating and Air-Conditioning Engineers, New York.

ENGINEERING HUMAN COMFORT

by L. P. Herrington*

A noted physiological ecologist describes objectively-based methods of determining human thermal requirements in complex environments. Dr. Herrington presented his findings as a participant of the panel entitled, "Design Factors and Resources" before the 1959 convention of the American Institute of Architects.

At this season, and in New Orleans, it is quite appropriate to remember that the human being is a tropical animal. Born naked we can continue in this unadorned state most comfortably at a temperature of about 85°F. Whether delivered to a tropical hammock or popped into an Alaskan parka, the thermal experience associated with our birth is a bio-climatic event of impressive proportions. This thermal shock to our natively virgin nervous system determines our first temperature standards. Thus, at birth, our sensitive skin, the body's largest organ, translates into the sensation

of first things, thermal shocks whose gross energy exceeds by a large factor the combined environmental energy impact on all those remaining senses whose good report is sought by the art and science of the architect (figure 1).

In the higher cultures, the chilly reception our world of air gives the infant is shortly followed by the routine of the hot bath. Anthropologists surmise that the thermal surprises of these first things have had a lot to do with what some culture groups think about the final things, perhaps with Dante in the lead. A medical friend of mine likes simpler interpretations. He claims that those who went north out of thermal Eden liked the cool air bath while those who went south preferred the hot water.

Since I am speaking to a distinguished group of architects in this city in the month of June, one might conclude from this that architects are

those who liked the bath. However this may be, the aim of these light remarks is definite. It is primarily to remind you that temperature is not only a precisely regulated body function, but that the sensations of temperature are primitive, powerful, and in their finer grades often associated with an emotional bias which greatly complicates the attempt to base design requirements entirely on subjective scales.

I had intended to discuss today the induction of specific forms of activity or behavior by moderate grades of thermal stress. This viewpoint on temperature and design problems is briefly expressed in Chapter XIV of the recent publication "Schoolhouse".¹ However, as a result of contacts and discussion at the recent AIA study group at Ann Arbor, I believe it is better to describe to you objectively based methods of determining human thermal requirements in complex environments, and to support this with a summary of current thought on the life and activity values of environments which optimize such physical factors as temperature.

I choose this course because we are about to live in a world in which a large portion of new construction—commercial, hospital, federal, military, industrial, and domestic—is likely to begin with plans which include design provision for controlled air quality and temperature.

The bulk of our current controlled environments probably serve commercial and domestic populations. For these relatively standardized situations design temperatures are reasonably established. However, for a broad class of human requirements in the immediate future, we need bio-engineering techniques which can quickly develop a design temperature from data such as this: occupant population, male; mean age, 35; working rate, 1.75 times rest activity; insulation value of required protective clothing, 1.2 clo units; process required mean radiant effect above air temperature, plus 10°F. Derive a combination of air temperature and air velocity which will (a) provide normal thermal adjustment, or (b) as a compromise, specified grades of heat or cold stress. I have selected an example from the industrial field. It would be quite as easy to take one from hospital, the school, or special military environments, including, of course, space vehicles.²

With this brief introduction to the generally unappreciated difficulty of designing optimal thermal environments, for any except the more usual civil situations, I am going to speak concisely to three points:

1. Do we have reliable calorimetric methods which are adequate for the measurement of the inter-actions of a complex thermal environment with the human body at rest, at work, and under various conditions of clothing insulation?
2. Can the basic data for such calorimeters be condensed and applied for thermal design use in a manner

(Continued on page 12)

	Auditory	Visual	Thermal
Rate (in watts)	2×10^{-13}	9×10^{-9}	120
Total Energy Processed (Kg Cal)	14×10^{-7}	6×10^{-3}	83×10^6
Ratio of Total Energy Flux for the Eye, Ear, and Body Skin	1	4000	$600,000,000 \times 10^5$

Figure 1: Mean transfer rates and life "quantum" integrals for energy transfers affecting primary human sensory modalities: despite the subjective equivalence of a sensation of average sound, average light and average warmth (1:1:1), the energy flux through the ear, eye, and thermal receptors of the skin is in the ratio of 1:4000: 6×10^{12} .

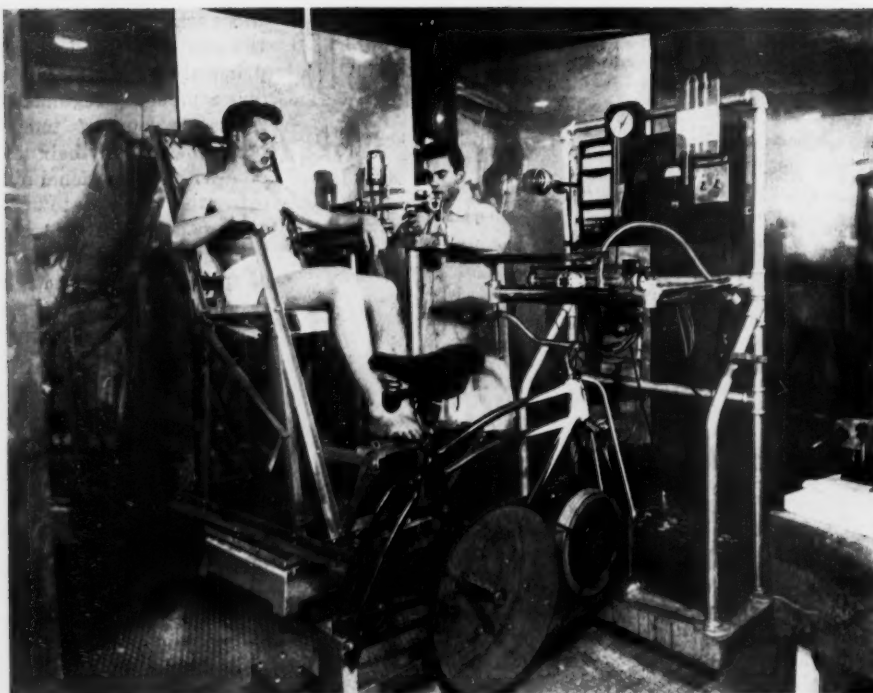
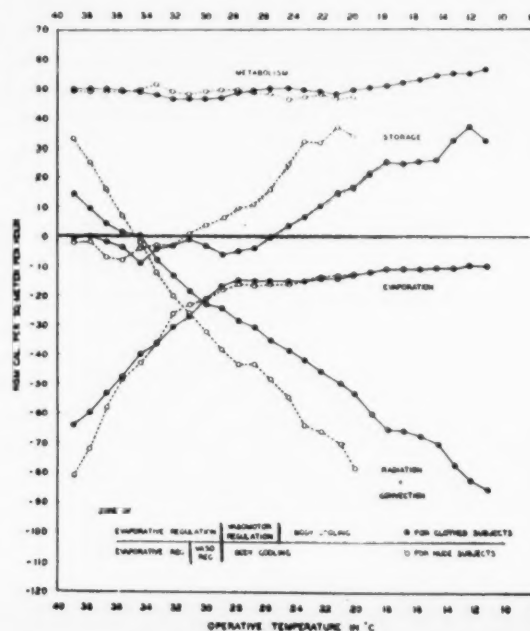


Figure 2: Heat audit in a partitioned calorimeter capable of simulating all climatic and working conditions. Unit has air temperature range of -40° to plus 180°F , with full control of humidity, air movement, and radiation. Latter provision permits thermal effects equivalent to a surrounding terrain and air temperature of equal value, and a standard air velocity, to be simulated by contrasting terrain and air temperatures at variable speeds. Radiant input is introduced through four ports in reflective panels, one of which is visible above observer's head. In this instance, subject is having vaporative weight loss determined as one measurement in a series including body temperatures, respiratory, cardiac and metabolic rates. These data permit partition of body heat generated into heat loss through separate physical avenues of convection, radiation and evaporation.

Figure 3: Example of a data panel describing the primary heat status of human subjects for a range of climatic conditions for a single set of clothing and activity specifications.



ENGINEERING HUMAN COMFORT

(Continued from page 11)

providing normal engineering convenience on problems involving industrial, school, or hospital populations?

3. Why are we doing this? What values beyond simple comfort are the rewards for the provision of temperature designs which are optimal from the human standpoint?

Let us take the first point:

The measurement of human adjustments to complex thermal environments

The simplest method of answering our first question concerning the existence of reliable methods of measuring human reactions to complex indoor as well as outdoor climates is to show you this picture of a partitioned calorimeter (figure 2). A heat audit is being made on this subject in a simulated climate that may range from -40°F to $+180^{\circ}\text{F}$ with all variations of humidity, radiation, and air movement. The essential purpose of such thermal audits is to build up a panel of data describing heat loss under any terrestrial conditions, including those we may transplant to space vehicles.

The calorimeter is referred to as partitioned since its reflectate aluminum walls enable one to separate infra-red heat exchanges between the skin of the subject and the surroundings from heat lost to the air, or through evaporation. By the use of treadmills or bicycle-ergometers, subjects at work and clothed in various ways may be measured. This particular instrument was developed by the author and colleagues at the John B. Pierce Foundation in New Haven. The biophysical and physiological contribution of this instrument to our quantitative knowledge of heat and cold stress is reviewed in many medical, physiological, and military environmental science reference sources (3, 4, 5).

Very recently means have been found for expressing the complex data of such experiments in a manner which is convenient and useful for bio-engineering problems which require prediction of human thermal adjustment in complex environments. The distinction between the analysis of primary calorimeter data, and the development from it of design tools of an equational nature, can be demonstrated by figure 3. This is a complete data panel describing in thermal detail the adjustment of a resting, unclothed subject to a wide range of climatic exposures. Although several years were required to collect, analyze, and test the validity of the data in this primary form for a given subject status, redress and activity, design application requires much additional study. This remark leads appropriately to my second point.

It is possible by mathematical means to develop a linear differential equation which expresses all of the design significance of the hundreds of entries composing the previous slide, to present this information in a single line. In figure 4, we

Age Yrs.	Basal Heat Production Cal/M/hr		Room Temperature For Normal Skin Temp. of 90.2°F	
	Male	Female	Male	Female
Kindergarten	4.5	5.7	61.9	62.3
Grade 4	10.5	48.0	45.7	
Senior H.S.	18.0	44.4	37.9	66.5
Personnel	22.5	40.9	35.8	69.4
Personnel	52.5	38.0	35.5	70.5
Personnel	62.5	35.5	32.7	70.5

1 Average Activity - 27% above Basal Heat Production (quiet school activities).
Standardized in terms of Calorimeter data, using equation:

$$\text{Avg. Skin Temp.} = 0.286 \text{ } T_{\text{air}} + 0.162 \text{ } T_{\text{rad}} + 0.105 \text{ Heat Prod.} \\ \text{Cal/hr} \\ 0.92 \text{ Evap} = 53.39 \\ \text{Cal/hr}$$

Figure 4: Environmental temperatures required to produce equal skin temperature in school occupants 4.5 to 62.5 years of age: Condensation of a data panel to a simple design equation and its application to show how the high heat production reduces the temperature of thermal neutrality at the younger ages, and as a function of male or female status. (Equation from: "The Human Heat Exchanger," L. P. Herrington, Trans. ASME, Heat Transfer Div., June '57.)

see such an equation. Although it may look formidable, a few minutes and a slide rule will derive from this expression the resultant mean body surface temperature to be expected in clothed human subjects after three hours' exposure to different combinations of air and wall temperature in the range from 40° to 80°F. Other terms in the equation allow for sex and age correlated heat production and evaporation. This slide likewise demonstrates how the equation may be applied to show that the school room temperature which produces a normal skin temperature in a kindergarten child is at least 80°F below the room temperature producing a normal skin temperature in teaching personnel age 50 to 60 years. The equation might likewise be used to show that as adult work varies from a sedentary level of 90 calories per hour through increasing levels of 125, 150, and 175 cal./hr., the design temperatures (figure 5) for a constant skin temperature decrease from 72°

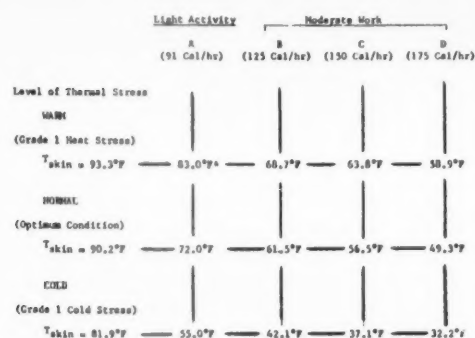


Fig. 5: Variations in design temperature requirements as affected by work level; values for optimal conditions and specified grades of compromise with process requirements.

cal./hr. to 49°F. Eventually we will have such human thermal design guides covering all tolerable temperature ranges, and all combinations of both normal and process-required protective
(Continued on page 14)



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ENGINEERING HUMAN COMFORT

(Continued from page 13)

clothing. These will be based on calorimetric data so established as to correct for age, sex, and work level differences in human heat production. Recent progress in this direction is discussed in recent publications (6,7) of the Committee on Bio-technology, Heat Transfer Division of the American Society of Mechanical Engineers.

Now let us consider the less technical but quite important third point of this discussion:

I am frequently asked what rewards other than subjective relief are associated with control of temperature stress. It is probably not necessary to tell architects that over the long course of history, high standards of habitation have probably contributed as much as any single factor to human health and well being. In company with proper nutrition and clothing, adequate housing is a major factor in the protection of mankind from climatic stress.

At least some of us are inclined at present to the view that while human life has an extreme range of perhaps 1 to 100 years, its average length of about 68 years represents a genetic endowment with an ability to process about 75 million calories of food energy. This total is a value of about 3,000 calories a day, averaging both sexes, all ages, and all classes of work. This figure is within plus 100 calories of the actual national values found in the United States and a good part of the Western world by current United Nations studies. On the above thesis of human life as a finite ability to convert energy, metabolically effective stresses, whether induced by temperature stress, hard labor, or other factors, may, if they exceed some optimum value, operate as life-reductive forces (figure 6).

Elimination of the stress of cold is a first effect

Temperature	Observed metabolism (cal.)	Biotherm exhaustion time (yr)
92F (33.3C)	3100	65.5
70 (21.1)	3441	59.0
60 (15.6)	3496	58.1
50 (10.0)	3651	55.6
32 (0)	3930	51.7
-30 (-34.4)	4900	41.5

Figure 6: Life expectancy reduction by cold stress. Adequate habitation reduces cold stress. On the hypothesis of a finite capability for total heat production, approximations of the effect of climate on longevity for an active military group are given. For a civil population about 10 years may be added to each estimate of life span for a given mean annual temperature.

of reasonably adequate habitation, and further favorable effects follow the more general use of air conditioning procedures on a year round basis. Investigations such as those which have been made on valance heating and cooling under the direction of George B. Bailey at the Pierce Foundation⁸ may provide new means of integrated year-round conditioning appealing to the architect as well as the public.

Final answers on the net quantitative longevity effect of all environment factors are in the future. Quite definite statements can be made on other

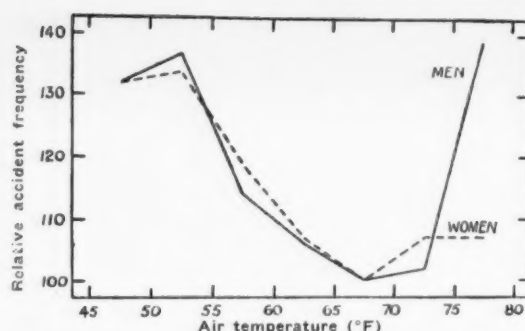


Figure 7: Accident frequency in relation to shop temperature during light semi-skilled assembly work. Statistics are from a study of munitions workers as reported by H. M. Vernon, English investigator. For related studies see Basic Principles for Heating & Ventilating, by T. Bedford; H. R. Lewis Co., London, 1948.

topics of great human significance. There is ample evidence to show that non-optimal thermal environments interfere with the precision of human action and contribute to accident rates (figure 7). The following slide illustrates this reduction in accident rate in semi-skilled factory work⁹, accidents increasing gradually on both sides of the temperature of 67 to 68°F appropriate for the slightly increased heat production status of this light work. Data of similar nature could be presented to show that in the heavy labor of coal mining the low accident rate is noted at a temperature near 50°F. The meaning of this is that there is a particular optimum environmental temperature range of a few degrees which is an important condition for the precise coordinated operation of hand, eye, and muscle, whether that operation be shoveling coal or moving the eye muscles reliably in adding a column of figures. Such optimum ambient temperature ranges vary systematically with the degree of work induced increase in human heat production.

Summary

In the opening remarks I mentioned some of our primitive experience with temperature shock which seems to establish in many a temperature bias which complicates the subjective report method of establish-group temperature preferences.

The fact was then noted that far more complex human design problems of a thermal nature are posed by the current extension of conditioning to groups with varied heat production and clothing than were ever encountered in past installations. Often this involves a quantitative estimate of a calculated compromise stress in which the requirements of man and process are given an optimum treatment.

To meet these problems, I discussed recent developments in bio-engineering which permit design prediction of the degree of human adjustment in complex thermal environments.

In view of the great concern at the present, both in civil and military areas, with human reaction to the environmental pressures of heat, radiation, light, and sound, I should like to close

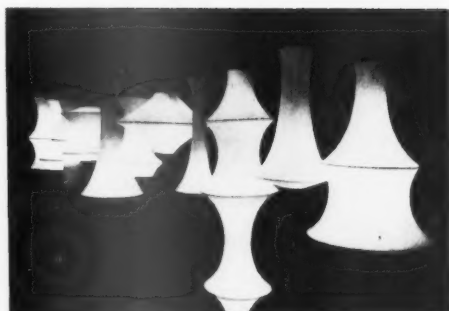
my discussion with a few rhetorical questions. The questions will serve to indicate some of the scientific context which moves the interest of the environmental physiologist and the bio-engineer in these fields we discuss today. For example, why is an optimum body temperature an indispensable condition for intelligent behavior? Do we have good reason to believe that unfavorable climates reduce human life expectancy and limit the attainments of a culture? Why do different classes of human activity show different optima at which accidents and errors of coordination are least frequent? How is it that the human body comes to reflect in part the ecological conditions of heat, light, moisture, and altitude? Finally, in the spirit of this program and the architect's sense of things esthetic and elusive, it has been said that there is a scholar's light. Currently the quality of human action in optimal environments permits us to add that there is also a scholar's heat.

Footnotes

1. *Schoolhouse*, chapter XIV, Joint School Research Project, Aluminum Company of America, Eggers & Higgins, Architects, and Walter McQuade. Simon & Schuster, New York, 1958.
2. *Selecting a Space Cabin Atmosphere*. Karl E. Schaeffer, *Astronautics*, vol. 4, no. 104, pp 28-39, 1939.
3. *Starling's Principles of Human Physiology*. 12th ed., pp 1061-1069, Lea & Febiger, Philadelphia, 1956.
4. *Physical Methods in Physiology*. W. T. Catton. pp 346-350. Philosophical Library, New York, 1957.
5. *Temperature and Humidity in Relation to the Thermal Interchange between the Human Body and the Environment*. L. P. Herrington & J. D. Hardy, chap. 13, pp 269-309, in *Human Factors in Undersea Warfare*, National Research Council, Washington, D. C., 1949.
6. *The Biotechnical Problem of the Human Body as a Heat Exchanger*. Transactions of the Am. Soc. of Mech. Engrs., vol. 80, no. 2, pp 343-346, Feb., 1958.
7. *Full Scale Human-Body Model Thermal Exchange Compared with Equational Condensations of Human Calorimetric Data*. L. P. Herrington, paper 58-A-181, contributed by the Heat Transfer Division, Annual Meeting, Nov. 30-Dec. 5, Am. Soc. of Mech. Engrs., New York, 1958.
8. *The Valance System*. P. H. B. Special Report, George B. Bailey & R. J. Lorenzi, Plumbing and Heating Business, March, 1959.
9. *Light Manual Work Involving an Element of Manual Dexterity*. E. E. Osborne and H. M. Vernon. Two contributions to the study of accident causation, industrial Fatigue Research Board, London, no. 19.

products, equipment, materials

Reports of recent developments by industry, based on data furnished by mfrs. Inquiry cards for further information face pages 8 and 32.



Fish net texture for light fixtures

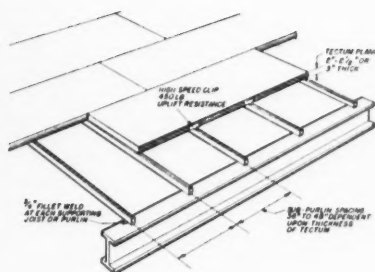
MFR'S DESCRIPTION: *Net Lights* are fully luminous fixtures constructed of vinyl-sprayed net.

USES: residential and commercial lighting applications.

SPECS/FEATURES: units are designed by George Nelson; feature fish net material stretched over metal or wood rings of various dimensions. Depending upon dimensions, units carry as many as four light bulbs.

AIA file no. 31-F-23

MFR: HOWARD MILLER CLOCK CO.
Circle 125 for further information.



Roof deck assembly with high strength

MFR'S DESCRIPTION: box section roof deck assembly is offered, having high strength roof deck and rigid box-type sub-purlin of galvanized steel.

USES: roof construction.

SPECS/FEATURES: box sections are light and easily handled; T-clips slide into place readily. Galvanized finish of sub-purlins is moisture-proof and maintenance free.

AIA file no. 12

MFR: TECTUM CORP.
Circle 126 for further information.



Adjustable lead pointer

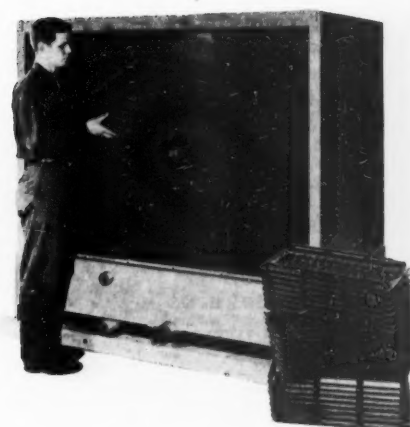
MFR'S DESCRIPTION: lead pointer has been developed for short, medium or tapered points.

USES: office aid.

SPECS/FEATURES: desired point can be obtained by adjusting length of lead. Can be used in portable or fixed position. Refills are one piece abrasive cups.

AIA file no. 35-H-4

MFR: C. HOWARD HUNT PEN CO.
Circle 127 for further information.



Cooling tower offers enlarged capacity

MFR'S DESCRIPTION: *Model AST Econ-O-Mizer* cooling tower features space and weight reductions of 50 per cent.

USES: outdoor cooling applications.

SPECS/FEATURES: design permits disassembly and reassembly quickly and easily on the site. Deck consists of high-impact polystyrene drip trays, fastened into "building blocks," stacked in housing, thereby making possible control of drip pattern and air flow. Models are

products, equipment, materials

equipped for automatic make-up water control valve, overflow, drain, pump suction fittings and debris screens.

AIA file no. 30-F-3

MFR: ACME INDUSTRIES, INC.
Circle 128 for further information.

KITCHENS

Eight automatic dishwasher models

MFR'S DESCRIPTION: automatic dishwasher with three cycle washing operation is offered.

USES: residential uses.

SPECS/FEATURES: eight models have washing cycles which clean crusted cooking utensils automatically. Interiors have polyvinyl coating which is corrosion resistant, increases sanitation and serves as cushion.

AIA file no. 29-H-7

MFR: THE WASTE KING CORP.
Circle 129 for further information.

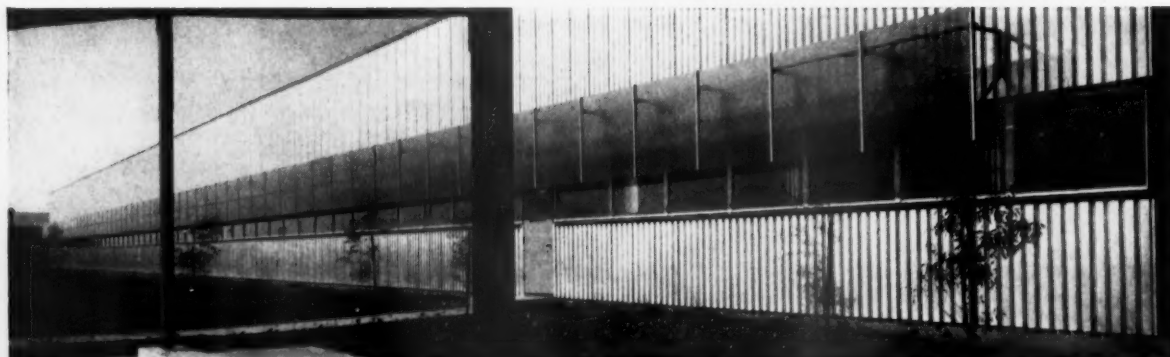
Square-shaped stainless steel urns

MFR'S DESCRIPTION: a line of stainless steel pressurized coffee urns, square-shaped to reduce counter space, has been introduced by S. Blickman, Inc.

USES: restaurants, cafeterias and allied food handling areas.

SPECS/FEATURES: mfr claims precise temperature and pressure controls, incorporated in line, provide a consistent high quality brew. Square design effects 50 per cent reduction in urn size, thereby requiring a minimum of counter space. Pressurization is reputed to cause lower operating costs and more comfortable working conditions because only five seconds per minute of heat input are necessary to maintain proper operating temperatures; savings in

LIGHT DIFFUSING GLASS MAKES...

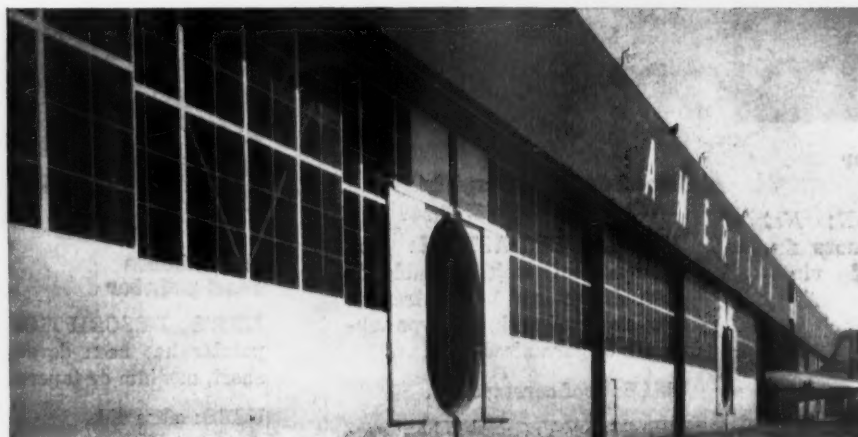


Architects: Marcel Breuer and Associates
Supervision: Craig Ellwood

A point of special architectural interest in the new Torrington Manufacturing Co. plant at Van Nuys, California is the sunshade of Coolite heat absorbing wire glass that spans the western elevation.

Complementing the spectacular new IBM offices in San Jose, California are these Hauserman partitions, glazed with lustrous Mississippi Broadlite glass.

Architect: John S. Bolles, San Francisco, Calif.
Partitions by: E. F. Hauserman Co., Cleveland, Ohio



1260 lights of 1/4" Coolite Wire Glass provide better daylight with protection, while absorbing excess solar heat in expansive American Airlines Hangar at Los Angeles International Airport.

Architect: Quinton Engineers Ltd., Los Angeles, California
Glazing by: W. P. Fuller and Company, Los Angeles, California



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WORLD'S LARGEST MANUFACTURER OF

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Daylighting and Dollars GO FARTHER

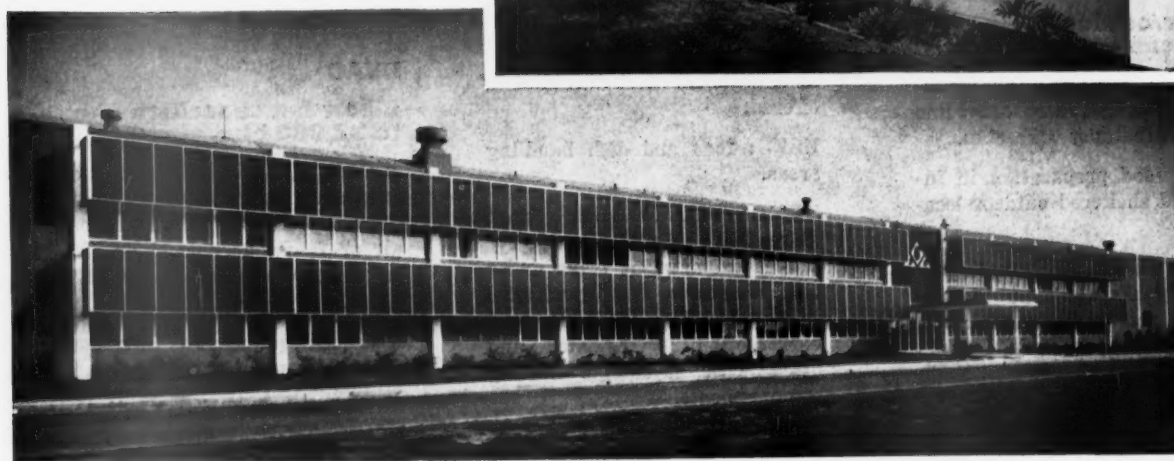
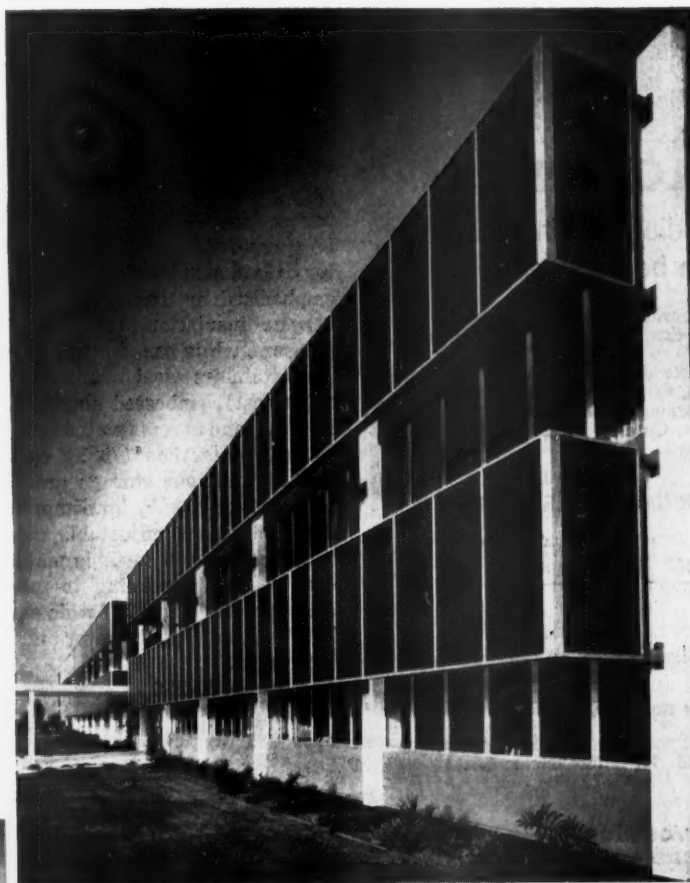
To make the most of daylight, use translucent, light diffusing glass by Mississippi. For utility, beauty and economy, unmatched by any other glazing medium, specify Mississippi Glass. Available in a wide variety of patterns, wired and unwired, at better distributors everywhere.

Write for new
1959 Catalog.
Address Department 18.



A place in the sun is especially desirable when heat absorbing blue-green Coolite Glass is there to help employees see better, feel better, work more comfortably. A brand new concept in "extended screen" glazing technique that combines beauty and utility.

Growers Container Corporation, Fullerton, Calif.
Architect: Falk and Booth, San Francisco, Calif.



GLASS COMPANY

88 Angelica St. • St. Louis 7, Mo.

ROLLED, FIGURED AND WIRED GLASS

Circle 106 for further information.



**products,
equipment,
materials**

fuel costs are also possible. Single, two- and three-piece batteries, combination urns and twin urns in three- and five-gallon sizes are available, for gas, steam or electric heating. Sides and bottoms are fused into single sheet of stainless steel to prevent melted-out bottoms and leaking seams. Further technical information available.

AIA file no. 35-C-3

MFR: S. BLICKMAN, INC.
Circle 130 for further information.

Self-contained refrigeration system

MFR'S DESCRIPTION: Plug assembly is welded, hermetically-sealed refrigeration system, designed to reduce service to minimum.

USES: normal temperature and freezer cabinets.

SPECS/FEATURES: sealing process prevents incorrect component replacement and field tampering. Unit is assembled without use of conventional screwed or flared fittings or capped service valves.

AIA file no. 30-F-22

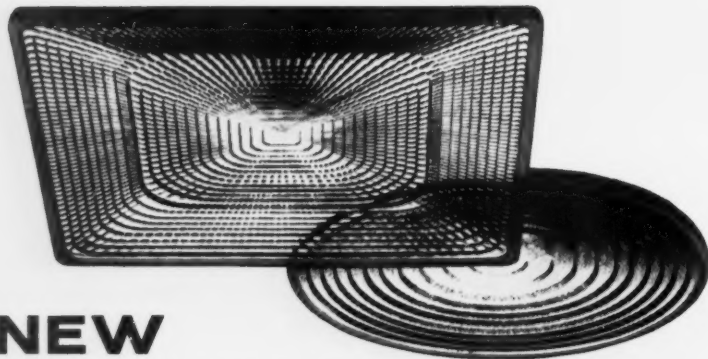
MFR: KOCH REFRIGERATORS, INC.
Circle 131 for further information.

Two-piece floating grid broiler

MFR'S DESCRIPTION: improved *Universal Chef* broiler featuring floating control of broiling grid surface, is now available.

USES: clubs, restaurants and institutions.

SPECS/FEATURES: grid can be raised or lowered to any position when directly under flames or when pulled all the way out. No cranks or levers are necessary; slight pressure on front bar of grid floats it into position.



NEW PYREX® CONCAVE SHALLO-LENS

... squares with added diagonal intensity
and rounds that can be "coloured"

With the new square Shallo-Lens you can fill in the areas between units which aren't normally illuminated, with symmetrical distribution... the result of added diagonal intensity built into the lens pattern.

A round design can be used and specified "coloured" for even softer illumination and lower brightness with risers glowing in the color desired.

Heat resistance. Both Shallo-Lens designs are made of PYREX brand heat-resistant glass, so you can use them in-

doors or out with no fear of breakage from sudden thermal shock or excessive heat.

For complete data and a closer look at the pattern, write for Bulletin L-121-J. Address: Corning Lighting Sales, 30 Crystal Street, Corning, N. Y.



CORNING GLASS WORKS

CORNING MEANS RESEARCH IN GLASS

Circle 107 for further information.

Grid is 27" x 37½", unobstructed and providing broiling area of more than 852 sq. in. To facilitate cleaning, grid is in two pieces. Eight rows of flame from four burners blanket grid area uniformly; left and right burners are controlled separately, light automatically and have a combined 100,000 BTU C.G.A. approved input.
AIA file no. 35-C-11

MFR: CRIBBEN AND SEXTON CO.,
SUBS. WASTE KING CORP.
Circle 132 for further information.

Refrigerator for bulk storage

MFR'S DESCRIPTION: *V-Line* refrigerators are available as volume food handling systems.

USES: restaurants, cafeterias and similar institutional uses.

SPECS/FEATURES: units feature adaptable interiors with drawers, shelves, meat rails, fractional pans, supports and portable food racks, all manually removable. Available in any combination of stainless steel, alumi-

num, baked enamel and porcelain finishes.

AIA file no. 35-C-3

MFR: VICTORY METAL MFG. CORP.
Circle 133 for further information.

Indoor/outdoor barbecue line

MFR'S DESCRIPTION: *Southern Host* is first in *Firebird* line of indoor/outdoor barbecues.

USES: food preparation in indoor and sheltered outdoor locations.

SPECS/FEATURES: unit permits shishkebab type skewer broiling, grill broiling and skewer roasting simultaneously. 1,700 lb tensile strength roller chain drives spits at even rate.

AIA file no. 35-C-11

MFR: BURR-SOUTHERN DIV.,
STATE STEEL INDUSTRIES, INC.
Circle 134 for further information.

Refrigerator/freezer for versatile storage

MFR'S DESCRIPTION: a small-scale twin freezer and re-

products, equipment, materials

frigerator, designed for flexibility and convenience, is available from Nor-Lake, Inc.

USES: various cold storage applications in areas with restricted space.

SPECS/FEATURES: matching units are near-cube shaped and each provide 5.17 cu.ft. of cooling or freezing space. They may be stacked, placed under a counter or laid side-by-side. Features emphasized by mfr are 2½ *Fiberglas* insulation, sealed compressors, white baked enamel finish (stainless steel available at extra cost), embossed aluminum interiors and chrome plated hardware. Freezer has 1/5 hp compressor and four storage areas; refrigerator has 1/8 hp compressor. Both have adjustable controls and three adjustable plated wire shelves, according to mfr. Units are 34" high, 27" wide and 27½" deep. Refrigerator unit illustrated.

AIA file no. 30-F-6

MFR: NOR-LAKE, INC.
Circle 135 for further information.

Portable stainless steel dish cart

MFR'S DESCRIPTION: portable, stainless steel dish cart is offered.

USES: food and dish handling areas.

SPECS/FEATURES: cart stores 360 9½" plates or 268 10" x 14" compartment trays under clean dish table; is easily wheeled to any location. Stainless steel construction is insulated and fitted with adjustable nesting compartments.

AIA file no. 35-C-13

MFR: LINCOLN MFG. CO., INC.
Circle 136 for further information.

Pedestal design is aid to sanitation

MFR'S DESCRIPTION: cafeteria counter, based upon pedestals, has been developed.

USES: cafeterias and other food handling institutions.

SPECS/FEATURES: use of pedestals eliminates skirts which formerly extended to floor, thereby facilitating sweeping, mopping, etc. All crevices, cracks and other impediments to cleaning have been removed. All facilities are run through the pedestals and apron and are readily accessible.

AIA file no. 35-C-3

MFR: S. BLICKMAN, INC.
Circle 137 for further information.

Combination dish handling unit

MFR'S DESCRIPTION: *Dish-o-lator* is combination unit to facilitate cleaning of dishes.

USES: food handling installations.

SPECS/FEATURES: units permit efficient scraping, rinsing and washing of soiled dishes, through convenient placement of facilities.

AIA file no. 35-C-13

MFR: THE BASTIAN-BLESSING CO.
Circle 138 for further information.

HVAC

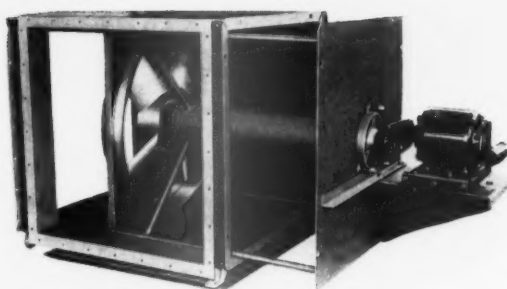
Elbow fan capacities to 32,000 cfm

MFR'S DESCRIPTION: packaged elbow fans which can handle clean or slightly contaminated air or fumes at normal or elevated temperatures are offered.

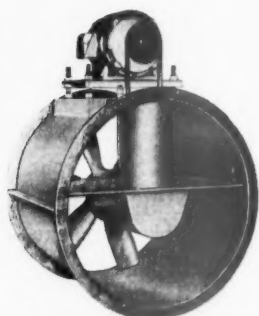
USES: general ventilation and with such equipment as furnaces, dryers, ovens and kilns.

SPECS/FEATURES: adjustable-pitch V-belt drive permits field adjustment of capacity to suit actual or changed conditions. Sheaves, motors and fan wheels may be interchanged for wider capacity. Standard units can handle up to 750° F.
AIA file no. 30-D-1

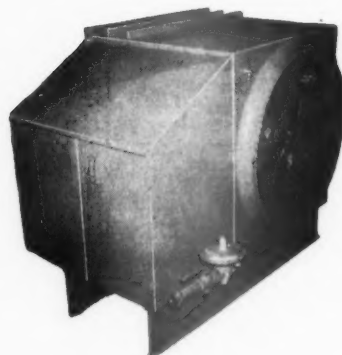
MFR: L. J. WING MFG. CO.
Circle 139 for further information.



138 ELBOW FAN
CAPACITIES TO
32,000 CFM



140 CORROSION-
RESISTANT DUCT
FANS



141 GAS-FIRED
INTAKE UNITS



142 SMOKELESS
COMBUSTION FOR OIL
BURNER

Corrosion-resistant duct fans

MFR'S DESCRIPTION: line of belt-driven, fibrous glass duct fans, resistant to most corrosive elements, is offered.

USES: industrial plants.

SPECS/FEATURES: propeller, duct section, drive housing and bearing cover are corrosion-resistant fibrous glass; drive shaft and hardware are of stainless steel. Available in 20", 24" and 28" diameters.

AIA file no. 30-D-1

MFR: HARTZELL PROPELLER FAN CO.
Circle 140 for further information.

Gas-fired intake units

MFR'S DESCRIPTION: line of direct-fired intake units provides almost 100 per cent combustion efficiency.

USES: air replacement in industrial exhaust systems.

SPECS/FEATURES: economy is achieved by burning natural or propane gas in line-of-flame burner directly in airstream. Combustion products are mixed with fresh outside air to eliminate air contamination.

AIA file no. 30-D

MFR: HARTZELL PROPELLER FAN CO.
Circle 141 for further information.

Smokeless combustion for oil burner

MFR'S DESCRIPTION: Zone-A-Matic hot water boiler features smokeless combustion at all air shutter settings.

USES: residential hot water heating systems.

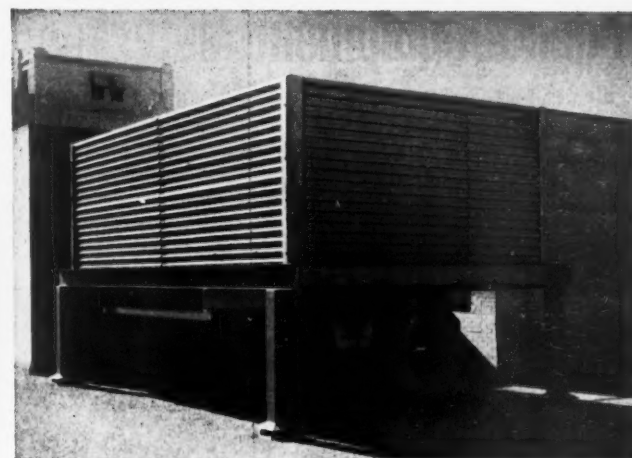
SPECS/FEATURES: intensified flame pattern achieves 100 per cent combustion of fuel particles while eliminating smoke and suppressing rumble.

AIA file no. 30-C-25

MFR: EDWARDS ENGINEERING CORP.
Circle 142 for further information.

Compact, portable crop drying fan

MFR'S DESCRIPTION: crop drying fan is designed to move



MARLEY UNDERFLOW

the cooling tower that whispers
knows no location limitations

Any area that will accommodate its plan dimensions is good enough for a Marley UNDERFLOW AQUA-TOWER, the tower that supplies its own grillage.

This unique low-silhouette tower for intermediate-capacity water cooling is based on a new principle of operation. The fan and air intake are located *beneath* the cooling cells and air is discharged vertically. Hence, without any sacrifice of performance, UNDERFLOW can be placed immediately adjacent to walled structures that would obstruct air intake and discharge in any other type of tower.

Wherever you choose to locate the UNDERFLOW, it will complement—not clash with—the architectural design. It is completely encased with asbestos cement board on all sides and most of the top, which means that fan, mechanical equipment, air intake—even piping—are out of sight. Inherent in this new design is a sound-baffling effect—a bonus benefit for every owner and one with special appeal for those concerned with installations on hospitals, hotels, and other buildings where whisper-quiet operation is essential.

If you believe that a cooling tower should not be seen—or heard . . . if you demand top performance with minimum maintenance . . . if you want all there is in intermediate-capacity water cooling . . . call your Marley Engineer today about the Marley UNDERFLOW.

The Marley Company

Kansas City, Missouri

Circle 108 for further information.

products, equipment, materials

more air per horsepower and retain quietness of operation.

USES: drying and safe storage in farm structures.

SPECS/FEATURES: unit features vane-axial wheel which is electrically driven. Air moving capacities range from 1,500 cfm at 4.0" of water to 12,600 cfm at 0.5" of water (static pressure). Blade diameters are 18" or 22".

AIA file no. 35-L

MFR: CHICAGO BLOWER CORP.
Circle 143 for further information.

ELECTRICAL UNITS

Motorized zone control valve

MFR'S DESCRIPTION: motorized valve is available, utilizing motor drive 75 times more powerful than clock motor.

USES: zone control for hot water systems.

SPECS/FEATURES: available in 3/4" and 1" sizes, valves do not need electric current to hold valves after they have opened or closed. Positive shut-off is insured so no thermal leakage occurs.

AIA file no. 31-N

MFR: EDWARDS ENGINEERING CORP.
Circle 144 for further information.

Circuit breaker rated at 125-800 amps

MFR'S DESCRIPTION: M frame circuit breaker has been developed to meet increased load requirements, higher interrupting capacities and greater ratings of commercial and industrial circuits.

USES: panelboards, control centers and switchboards.

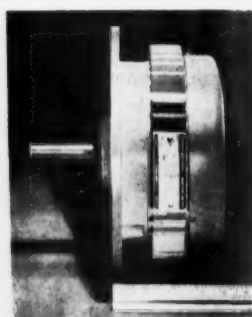
SPECS/FEATURES: available with either two or three poles, unit is rated from 125 amps to 800 amps at 600 v ac and 250 v dc. Interrupting ratings are 50,000 amps at 240 v ac, 35,000



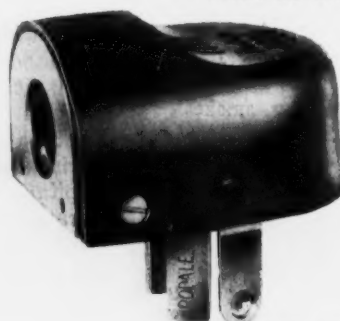
144 MOTORIZED
ZONE CONTROL
VALVE



145 CIRCUIT
BREAKER RATED
AT 125-800 AMPS



148 SHORTER,
LIGHTER INDUS-
TRIAL MOTOR



149 ANGLE CAP
FOR DIRECT LINE
CONNECTION

amps at 480 v ac and 25,000 amps at 600 v ac. UL approved.

AIA file no. 31-D-4

MFR: FEDERAL PACIFIC ELECTRIC CO.
Circle 145 for further information.

Mounting bracket for time switches

MFR'S DESCRIPTION: special mounting bracket for time switches is offered, independent of cases.

USES: refrigeration, water softeners and pool pump and filter systems.

SPECS/FEATURES: U-shaped bracket permits easy installation in enclosures and panels. No screws are necessary; time switch is snapped into bracket.

AIA file no. 31-D

MFR: TORK TIME CONTROLS, INC.
Circle 146 for further information.

Electric controls with various mountings

MFR'S DESCRIPTION: electric controls with various mountings are offered.

USES: engine-generator sets in power applications.

SPECS/FEATURES: designed for a variety of ac and dc applications, single or dual voltage, for generators up to 500 KW. Cabinets accommodate any combination of instruments, switches and voltage regulators.

AIA file no. 34-G-4

MFR: AKRO INDUSTRIES, INC.
Circle 147 for further information.

Shorter, lighter industrial motor

MFR'S DESCRIPTION: Thin-line motor is up to 55 per cent shorter and 26 lbs lighter than NEMA type D flange motors of same rating.

USES: machine tool, fan and blower applications.

SPECS/FEATURES: unit provides more horsepower in less

space. Permits flexibility in choice of mounting flanges: NEMA type D flange dimensions and special flanges without mounting rabbetts. Also permits compact design of equipment.

AIA file no. 31-G

MFR: GENERAL ELECTRIC CO.
Circle 148 for further information.

Angle cap for direct line connection

MFR'S DESCRIPTION: 30 amp and 50 amp 90° angle caps have been introduced, to allow cables to lie in direct line with connection.

USES: transformer carts or generator sets on welding equipment.

SPECS/FEATURES: available with straight or L-blade arrangement, with or without grounding prongs. Units save amount of floor space taken up by cables. Models are UL listed and CSA approved.

AIA file no. 31-C-73

MFR: RODALE MFG. CO., INC.
Circle 149 for further information.

Intercom/radio system features aluminum grille

MFR'S DESCRIPTION: Nutone intercom/radio system, with better tone and volume transmission, is available.

USES: residential uses.

SPECS/FEATURES: speaker grille is perforated Rigid-tex aluminum which will not absorb sound or gather dust. Transmission from speaker is not muffled or distorted.

AIA file no. 31-i-51

MFR: RIGIDIZED METALS CORP.; NUTONE, INC.
Circle 150 for further information.

Switch box clamp needs no screws

MFR'S DESCRIPTION: Q Quick-Clamp has been added to Raco line.

USES: outlet and switch box installations.

CREATIVE DESIGN IN WALLS OF GLASS AND ARCHITECTURAL BRONZE

Here are excellent examples of the broad range of curtain-wall design made possible with Architectural Bronze. At the right the metal components consist of bronze extrusions, including a large I-beam shape for the mullion, and Muntz Metal sheets for the spandrels. Below, the design for the glass framing incorporated standard sizes of Architectural Bronze angles, bars and Red Brass rectangular tubes.

The distinctive elegance of Bronze is unsurpassed, whether it is seen in the bright color of the metal—in the warm statuary bronze finish obtained by treatment, as in these two buildings—or by natural weathering.

Details of these and other curtain-wall designs are given in our new publication, "Architectural Metals" by Anaconda. Its 64 pages also give practical and detailed information on the available metals, their compositions, colors, forms, physical properties, architectural applications, instructions for obtaining various finishes, detailed specifications and many pages of fabricators' shop drawings. Send today for your copy. Address: The American Brass Company, Waterbury 20, Conn. In Canada, Anaconda American Brass Ltd., New Toronto, Ont.

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5923



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SPECS/FEATURES: cable is held firmly in clamp without screws or threads. Unit is heat treated spring steel; exceeds UL standards.

AIA file no. 31-D

MFR: ALL-STEEL EQUIPMENT INC.

Circle 151 for further information.

Corrosion resistant automatic control

MFR'S DESCRIPTION: *Auto-Bin-Dicator* is automatic bin level indicator, offered in standard and explosion models.

USES: bulk material handling in locations subject to corrosion and chemical action.

SPECS/FEATURES: UL approved unit has body of aluminum castings and diaphragm of stainless steel for corrosion resistance, even when enveloped by material.

AIA file no. 35-L

MFR: BIN-DICATOR CO.

Circle 152 for further information.

Reduced size substation

MFR'S DESCRIPTION: *Power-Zone*, package unit substation, has reduced size.

USES: minimum space applications.

SPECS/FEATURES: unit is 79½" high, 94" long and 36" deep; requires only minimum of installation space. Components can be reached from front, permitting installation against wall. Available with capacities from 75 KVA to 300 KVA, with high voltages up to 4,800 v and low voltages up to 600 v.

AIA file no. 31-A

MFR: SQUARE D CO.

Circle 153 for further information.

LIGHTING

Fire-resistant diffuser

MFR'S DESCRIPTION: *Circl-*

grid is fire-resistant, rigid, luminous panel which meets strict municipal fire codes.

USES: lighting louvers.

SPECS/FEATURES: 23¾" squares now in full production, 2' x 4' panel to be available in October. Twin sheets are vacuum formed and hermetically sealed by welding at thousands of points. May be installed with any inverted tee supporting system.

AIA file no. 31-F-2

MFR: CIRVAC PLASTICS CO.

Circle 154 for further information.

Shallow troffers with telescopic frame

MFR'S DESCRIPTION: *Speedomatic* troffers, in four types, are offered.

USES: ceiling illumination.

SPECS/FEATURES: troffers recess only 4½" deep. Telescopic door frame automatically adjusts to assure perfect fitting. Features incorporated to facilitate installation.

AIA file no. 31-F-23

MFR: SMITHCRAFT LIGHTING

Circle 155 for further information.

CONSTRUCTION

Fastening tool useful in seismic surveys

MFR'S DESCRIPTION: *Ramset* is powder-actuated fastening tool to set pin-type and threaded fasteners into concrete and steel.

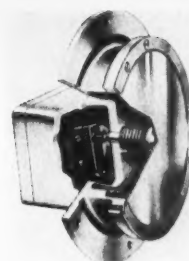
USES: construction and maintenance.

SPECS/FEATURES: firing of tool without fasteners, against steel plate creates even flow of shock waves, enabling computation of depth of soils and rock formations. Powder charge causes waves to be uniform and precisely controlled.

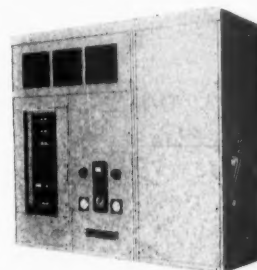
AIA file no. 17-F

MFR: OLIN MATHIESON CHEMICAL CORP.

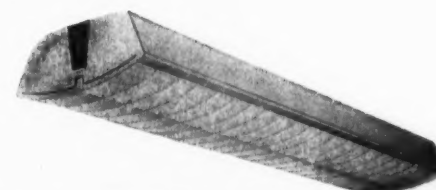
Circle 156 for further information.



152 CORROSION RESISTANT AUTOMATIC CONTROL



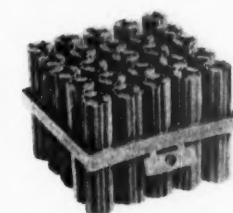
153 REDUCED SIZE SUBSTATION



155 SHALLOW TROFFERS WITH TELESCOPIC FRAME



157 POWDER-CUTTING PROCESS FOR CONCRETE



159 VINYL PLASTIC SCREW ANCHORS

Powder-cutting process for concrete

MFR'S DESCRIPTION: flame powder-cutting process has been developed to eliminate noise, vibration and dust in remodeling and construction work.

USES: concrete cutting process.

SPECS/FEATURES: process employs a mixture of iron and aluminum powder, fed into oxy-acetylene flame, causing reaction that slices quickly and cleanly through reinforced concrete.

AIA file no. 8-D

MFR: LINDE CO., DIV. UNION CARBIDE CORP.

Circle 157 for further information.

Joist hanger design aids installation

MFR'S DESCRIPTION: formed seat joist hanger has been added to *Strong-Tie* line.

USES: construction accessories.

SPECS/FEATURES: units have vertical and torsional load capacities up to 3,200 lbs ultimate; formed of 18-ga., coated galvanized steel. Seat, sides and top-bend are work hardened under 120,000 lbs pressure to provide holding power and resistance to torsional stress.

AIA file no. 14-J

MFR: SIMPSON CO.

Circle 158 for further information.

Vinyl plastic screw anchors

MFR'S DESCRIPTION: *Expandet* screw anchors are available with eight diameters.

USES: plaster, tile masonry and other drillable materials.

SPECS/FEATURES: anchor has no lip to prevent flush fixture fit; will not fray or flatten out when driven with hammer. They are unaffected by weather changes and require no lubricant for installation.

AIA file no. 3-M

MFR: DANISH IMPORT

Circle 159 for further information.

LABYRINTH WATERSTOPS

**A SOUND INVESTMENT
FOR CONCRETE CONSTRUCTION!**



LABYRINTH AVAILABLE IN 2, 3 or 4 rib.

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1. Consider the investment in design, materials and labor (to mention a few).
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- There's a Water Seal product for every type of concrete work!

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Circle 110 for further information.

products, equipment, materials

Precast cellular concrete material

MFR'S DESCRIPTION: *Calsi-Crete* panels are precast cellular concrete building material.

USES: residential construction, roof decks and other industrial uses.

SPECS/FEATURES: material is strong and has soundproofing and insulating qualities; is five times lighter than concrete. Composed of Portland cement, silica flour, mineralized cellulose, water, chemical and foam.

AIA file no. 4-E

MFR: CMC HOMES, INC., SUBS OF CONTINENTAL MATERIALS CORP.
Circle 160 for further information.



161 CONCEALED MECHANISM FOR AUTOMATIC ENTRANCE



162 SOUNDPROOF LOUVER DOOR PERMITS AIR PASSAGE



163 ALUMINUM WINDOW WITH STABLE SASH MOTION

DOORS/WINDOWS

Concealed mechanism for automatic entrance

MFR'S DESCRIPTION: *Amar-lite*, electrically operated entrance, has been introduced.

USES: institutional, industrial and commercial installations.

SPECS/FEATURES: electric-hydraulic mechanism is concealed in the transom bar, eliminating floor preparation, wiring and reinforcement. Electrical unit may be adjusted or removed without hindering door operation. Requires only 110 v current.

AIA file no. 16

MFR: AMERICAN ART METALS CO.
Circle 161 for further information.

Soundproof louver door permits air passage

MFR'S DESCRIPTION: soundproof louver door, combining qualities of soundproof hollow metal door and sound trapped air transfer duct, is available.

USES: private offices, conference rooms, hospital rooms, etc.

SPECS/FEATURES: supply or return air is permitted to pass through door without sacrificing privacy. Transmission loss is 32 decibels, for installation in a 4"

masonry block wall. Furnished with door frame, pneumatic and aluminum adjustable gasketing and adjustable threshold sealing mechanism.

AIA file no. 16-F

MFR: ELOF HANSSON, INC.
Circle 162 for further information.

Aluminum window with stable sash motion

MFR'S DESCRIPTION: *Ualco* aluminum single hung window features polyethylene guide shoes to stabilize vertical motion and eliminate side play.

USES: operation of units is silent; tension can be varied. All sections are heavy aluminum extrusions with fixed meeting rails.

AIA file no. 16-E

MFR: SOUTHERN SASH SALES & SUPPLY CO., INC.
Circle 163 for further information.

Pre-glazed aluminum awning window

MFR'S DESCRIPTION: *Series 500-A* is pre-glazed aluminum awning window, designed to be low cost unit.

USES: residential and light construction.

SPECS/FEATURES: furnished with aluminum mill finish protected by coating of methacrylate lacquer. Included is right-hand, heavy-duty offset operating mechanism of worm and gear type and draw bar which rides on nylon guides.

AIA file no. 16-L

MFR: TRUSCON DIV., REPUBLIC STEEL CORP.
Circle 164 for further information.

Aluminum jalousie eliminates cranking

MFR'S DESCRIPTION: *Touch-O-Matic* is aluminum jalousie automatically opened by push-button.

USES: residential installations.

SPECS/FEATURES: no motors, batteries, accessories or outside attachments are required.

Push-buttons are factory installed to save time in field. Opening action is automatic and smooth.

AIA file no. 16-L

MFR: UNIVERSAL FABRICATORS, INC.

Circle 165 for further information.

PLUMBING UNITS

Stainless steel water cooler

MFR'S DESCRIPTION: *H-3S*, electric water cooler, provides large capacity in 1 sq ft of floor space.

USES: small offices, stores and industries.

SPECS/FEATURES: features 18.8, one-piece stainless steel, splash-proof drinking top with removable grid and electrolytically polished finish that resists spotting. Refrigerating system is hermetically sealed.

AIA file no. 29-D-42

MFR: CORDLEY & HAYES

Circle 166 for further information.

Electrically operated solution feed pump

MFR'S DESCRIPTION: *No. 77 Solution Feeder* is electrically operated diaphragm pump with feed rate adjustable from one pint to three quarts per hour.

USES: chlorination of home well water systems.

SPECS/FEATURES: unit will feed into any water line having up to 100 psi pressure. Also capable of feeding hypochlorite solutions to precipitate dissolved iron and hydrogen sulfide in conjunction with filtering systems.

AIA file no. 29-D-5

MFR: CALGON CO.

Circle 167 for further information.

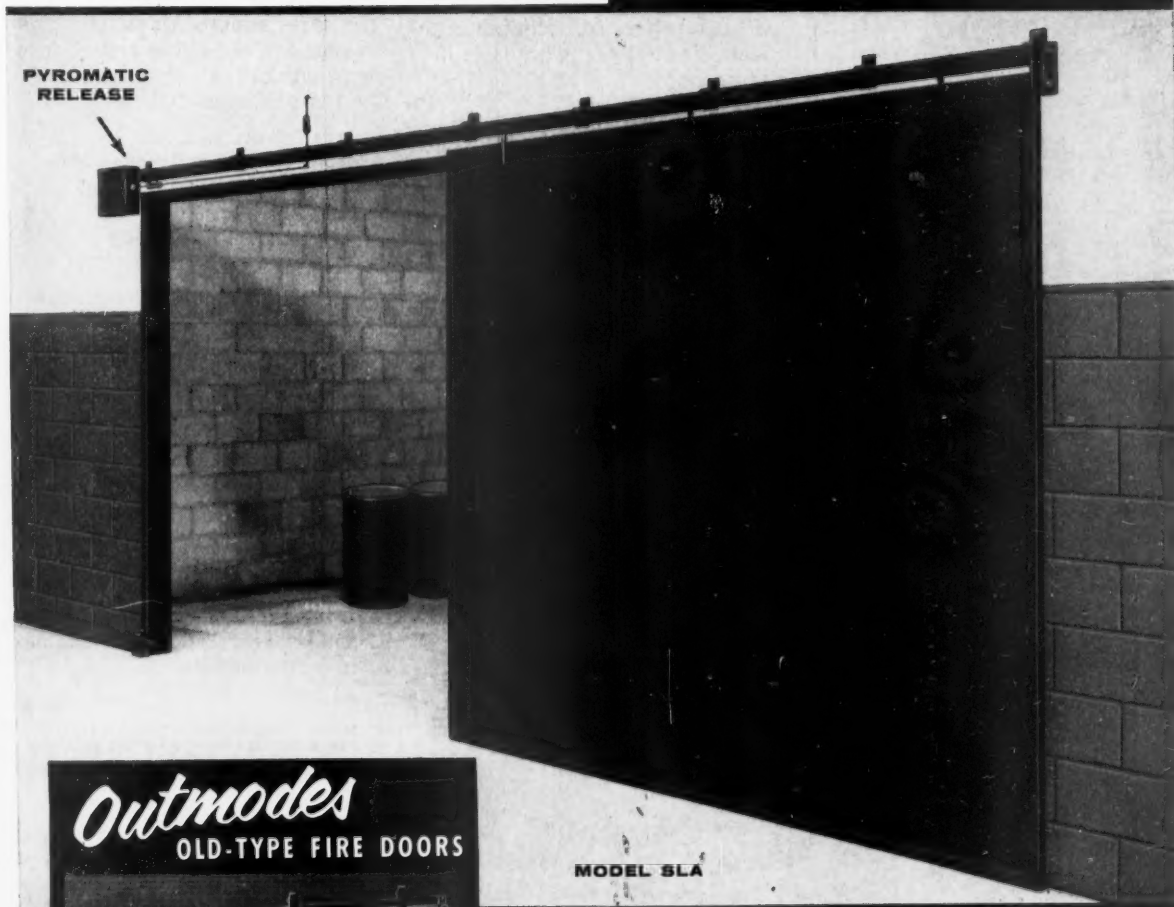
Rigid polyethylene toilet seat hinges

MFR'S DESCRIPTION: toilet seat hinges of rigid *Marlex* polyethylene are offered.

USES: bathroom installations.

SPECS/FEATURES: designed as sanitation aid, product's color and finish remain bright after

Another D & H First! THE NEW SLIDING PyroDor® The Forward Look in Fire Doors!



UNDERWRITERS' LABELED
3 HOUR TEST
Plus Lowest Heat Transmission



WHY D & H SLIDING PyroDors ARE OUTSTANDING—

- CONTEMPORARY FLUSH DESIGN, SMOOTH LOOKING, Interlocking Panel Sections.
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The Industry's Most Complete Line Of
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DUSING and HUNT, Inc.

Over 50 yrs. Manufacturing Fireproof Doors & Metal Trim
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Circle 111 for further information.

repeated cleanings. Available in coral, yellow, green, beige and other colors, units are rust free, resistant to chemicals and corrosion, will not chip or crack, and are non-toxic.
AIA file no. 29-H

MFR: C. F. CHURCH DIV., AMERICAN-STANDARD
Circle 168 for further information.

Reciprocating stainless steel pump

MFR'S DESCRIPTION: *Pogo SS* is air-operated, reciprocating stainless steel pump, available in seven models.

USES: transferring of such fluids as pharmaceuticals, dyes, inks, alcohols, etc.

SPECS/FEATURES: unit weighs less than 20 lbs and delivers from 3-5 gallons of material per minute. Air motor piston cups are self-oiling and require no lubrication.
AIA file no. 29-D-5

MFR: BINKS MFG. CO.
Circle 169 for further information.

Off-center lavatory provides added space

MFR'S DESCRIPTION: *New Lucerne* has left edge which curves inward to permit storing small articles such as toiletries.

USES: commercial and residential installations.

SPECS/FEATURES: over-all size is 20" x 18" or 24" x 20". Front and right rims slope downward to permit water to drain into bowl. Also features concealed front overflow, anti-splash rim and integral soap dish. Available in white and eight colors.
AIA file no. 29-H

MFR: AMERICAN-STANDARD PLUMBING AND HEATING DIV.
Circle 170 for further information.

OFFICE AIDS

Spring clamp punchless binder

MFR'S DESCRIPTION: *Acco-grip* is binder designed to hold unpunched sheets firmly.

USES: office binding needs.

SPECS/FEATURES: unit has up to 1/2" capacity, yet holds even single sheet firmly. No punching is necessary; spring-action clamp provides secure binding. Available in letter and legal sizes in five colors.

AIA file no. 35-H-4

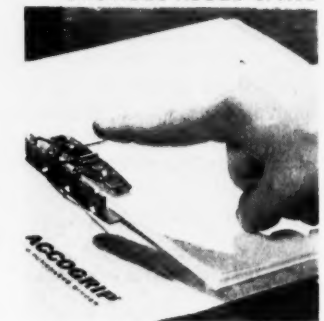
MFR: ACCO PRODUCTS
Circle 171 for further information.

Durable automatic calculator

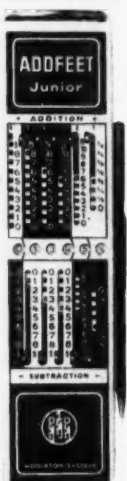
MFR'S DESCRIPTION: *Add-feet Calculator*, manufactured by Addiator Rechenmaschinen-



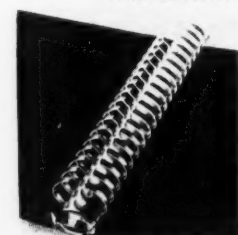
170 OFF-CENTER LAVATORY PROVIDES ADDED SPACE



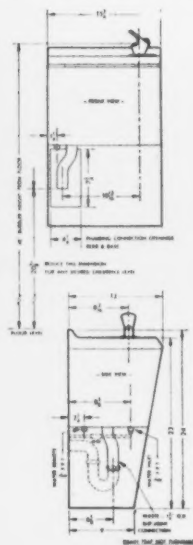
171 SPRING CLAMP PUNCHLESS BINDER



172 DURABLE AUTOMATIC CALCULATOR



173 LOCKING DEVICE FOR LOOSE-LEAF BINDERS



Haws Model HWT-13



CLEAN
from every angle...



HAWS brilliant new wall mounted electric water coolers are a *clean break* with tradition! Compact design hugs the wall - leaving floor area clear! Crisp, *clean styling* is crowned by gleaming stainless steel - with plumbing and electrical unit completely enclosed. HAWS "clears the deck" for uncluttered maintenance ease and shining *clean floors*. This innovation in water cooler concept and design scores a *clean sweep* for HAWS - leader in the field since 1909! Find out about HAWS' complete line of drinking facilities. See HAWS Catalog in Sweet's Architectural File or write for your copy today.



HAWS DRINKING FAUCET CO.
1441 Fourth Street
Berkeley 10, California

WRITE FOR DATA ON HAWS CAFETERIA AND RESTAURANT WATER COOLERS
Circle 112 for further information.

fabrik of West Berlin, is designed to convert fractions into inches and inches into feet automatically.

USES: architectural and engineering drafting offices.

SPECS/FEATURES: operated by stylus movement, unit adds or subtracts with capacity of 9,999' 11 $\frac{1}{2}$ ". Price is \$4.95. AIA file no. 35-H-3

MFR: CONTINENTAL EXCHANGE
Circle 172 for further information.

Locking device for loose-leaf binders

MFR'S DESCRIPTION: *Golden Key* is strong, easy to recognize locking device for multiple ring loose leaf binders.

USES: heavy and confidential catalogs where protection must be guaranteed.

SPECS/FEATURES: *Golden Key* is available with 1 $\frac{1}{2}$ " metal loose leaf binding, with standard multiple hole pattern. Gold plated lock is readily identified. AIA file no. 35-H-4

MFR: GENERAL BINDING CORP.
Circle 173 for further information.

Tear drop curves for highway layout

MFR'S DESCRIPTION: transparent curves have been introduced to facilitate layout work involving circles and arcs.

USES: drafting rooms.

SPECS/FEATURES: effective primarily in short-radius work such as limited-speed controls, exits, entrances and acceleration/deceleration lanes. Can be used on drawings to any scale; can be used to draw 270° curves in one operation. Set contains 11 curves.

AIA file no. 35-H-3

MFR: KEUFFEL & ESSER CO.
Circle 174 for further information.

Plastic sheets for reproduction masters

MFR'S DESCRIPTION: system, designed to produce positive and negative masters simultaneously, was developed by Columbia Ribbon and Carbon Mfg. Co., of Du Pont's *Mylar* polyester film.



THE PTL is excellent for estate type subdivisions, drive-ways, parks, hotel grounds, and recreation areas. The design lends the elegance of low, even lighting and the

safety of good light with a minimum of glare. Subdividers and landscape architects will find the PTL well suited to their esthetic needs without sacrificing light efficiency.

New L-M Post Top Light Combines Appearance with High Efficiency

The new L-M PTL (Post Top Luminaire) combines decorative appearance with a highly efficient optical system. It is specially suitable for lighting drive-ways, residential and institutional grounds, schools, stores, subdivisions, parks, swimming pools, railway platforms, bus stations, and other places where the designer wants both good appearance and efficient light utilization.

Rigidly Built

The PTL combines a rigid spun-aluminum reflector, an efficient Holophane® refractor, and a sturdy aluminum mounting base. Reflector swings open on hinge for easy cleaning, and for replacement of lamps and ballasts.

Reflector and base in natural brushed aluminum, or choice of pastel colors. Available with small cadmium-sulphide

photo control, which automatically turns light on at dusk and off at dawn.

Choice of Five IES Patterns

For use with incandescent lamps up to 10,000 lumens, or 620 watts multiple; or with ballast in fixture for mercury vapor lamps up to 250 watts. Choice of five IES light patterns; types I, II, III, II 4-way, and V.

Two styles, for mounting on 3-inch or 7-inch poles. Tapered aluminum poles are available, to provide from 11- to 25-foot mounting heights.

Attractive Low Prices

Prices of the PTL luminaire start at \$44; aluminum poles \$46 and up. Mail the coupon below for free data sheets and details. Or contact any of the L-M offices.



THE NEW L-M PTL provides elegance of appearance and efficiently controlled light distribution. Available in brushed aluminum, or pastel colors, for 3- or 7-inch poles. For incandescent lamps, or with ballast for mercury vapor lamps. The PTL is also available with small photo control. Prices start at \$44.



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DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
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418

Circle 113 for further information.



**Equip Every Department Individually
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Rotolite

is the quickest most inexpensive way you EVER heard of to make white copies of anything translucent. Takes SO little space. Just Hang it on the wall. You'll say "Boy! what a time-saver and cost-saver! I sure need one in My office!"

PRICES:

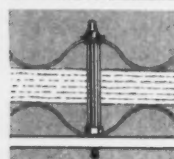
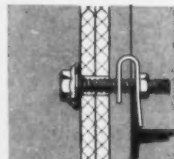
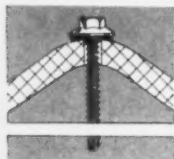
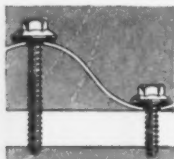
18" \$129.50. 27" \$149.50. 42" \$189.50
Slightly higher, Denver and West,
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Write for folder.

Circle 114 for further information.



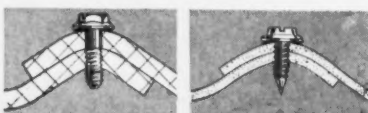
TOWNSEND gives you the complete package— the correct fastener plus field service

Townsend Tuff Tite fasteners are specifically designed for use with each type of construction material and method of application. This enables Townsend engineers to give you impartial assistance in selecting the right fastener for your particular job.

The wide variety of Tuff Tite fasteners gives you the advantage of leak-proof construction for all types of roofing and siding.

Each Tuff Tite is made with an integral head and washer plus an assembled neoprene washer, which is trapped by the undercut in the head when the fastener is tightened. The result—positive leakproof construction.

Write for Bulletin TL-149 to Townsend Company, Engineered Fasteners Division, P.O. Box 71-V, Ellwood City, Pennsylvania. In Canada: Parmenter & Bulloch Manufacturing Company, Limited, Gananoque, Ontario.



Circle 115 for further information.

products, equipment, materials

USES: preparing master copies of drawings and typed matter.

SPECS/FEATURES: positive master is Mylar, translucent matte finish; negative is tracing carbon. Impressions made on translucent film transfer positive carbon image to matte side, leaving negative effect on carbon sheet. Impressions are sharp; do not smudge or smear.

AIA file no. 35-H-31

MFR: E. I. DU PONT DE NEMOURS & CO.; COLUMBIA RIBBON AND CARBON MFG. CO.
Circle 175 for further information.

MISCELLANY

Elastic tape/synthetic rubber sealer

MFR'S DESCRIPTION: *Press-tite* no. 612 has been added to line of sealants.

USES: various construction sealants.

SPECS/FEATURES: product combines elastic compound tape for close bonding with Neoprene insert for resiliency. Features include plasticity, adhesion and weather resistance.

AIA file no. 17-J

MFR: PRESTITE DIV., AMERICAN-MARIETTA CO.
Circle 176 for further information.

Polyethylene film in 40' widths

MFR'S DESCRIPTION: seamless polyethylene film up to 40' wide is now in production.

USES: construction and farm use.

SPECS/FEATURES: 24', 28', 32' and 40' widths are available, four-folded in standard dispenser cartons. Film is edgeprinted.

AIA file no. 24-D

MFR: THE KORDITE CORP.
Circle 177 for further information.

Self-contained portable testing machine

MFR'S DESCRIPTION: portable combination compression/tension testing machine is hand

operated and self-contained.

USES: testing concrete cylinders in either field or laboratory installations.

SPECS/FEATURES: designed for testing specimens in tension up to 100,000 lb load capacity. Tension grips are included. Total weight of unit is 500 lbs.

AIA file no. 4-A-1

MFR: SOILTEST, INC.
Circle 178 for further information.

Six colors for classroom chalkboards

MFR'S DESCRIPTIONS: *Slato-Steel* chalkboard is now available in six colors.

USES: classroom applications.

SPECS/FEATURES: board is lightweight; impervious to chipping, cracking and cleaning solutions. Furnished with anodized aluminum trim and chalk trough.

AIA file no. 35-B-1

MFR: BECKLEY-CARDY CO.
Circle 179 for further information.

Fibrous glass reinforced shingle

MFR'S DESCRIPTION: asphalt shingles, reinforced with *Fiber-glas*, are offered.

USES: roofing applications.

SPECS/FEATURES: layers of bonded glass fibers serve as reinforcement for coating grade asphalt. Available in 12" x 36", three-tab strip in four solid colors and six blends.

AIA file no. 19-D

MFR: OWENS-CORNING FIBER-GLAS CORP.
Circle 180 for further information.

Wall system eliminates interior framing

MFR'S DESCRIPTION: *Pabco-wall* is self-supporting, interior wall partition, fabricated from special panels of gypsum wall-board.

USES: residential installations.

SPECS/FEATURES: three thicknesses used to form rigid

wall and eliminate wood studs and supports in interior partitions. Also available is movable wall system for office and industrial use. Short installation time is salient feature.

AIA file no. 23-L

MFR: PABCO BUILDING MATERIALS DIV., FIBREBOARD PAPER PRODUCTS CORP.

Circle 181 for further information.

Larger width extruded aluminum sections

MFR'S DESCRIPTION: extruded flat, 28.08" aluminum sections are being produced.

USES: curtain walls, bridge and highway construction and materials handling equipment.

SPECS/FEATURES: alloy 7178 is extruded flat on 12,000 ton hydraulic press, permitting closer tolerances and cross-sectional uniformity. Comparable to fabricated steel sections, with advantages of better strength to weight ratio, lower fabricating costs and resistance to corrosion.

AIA file no. 17-A

MFR: HARVEY ALUMINUM
Circle 182 for further information.

Flexible laboratory furniture

MFR'S DESCRIPTION: a series of flexible laboratory furniture units are offered.

USES: research lab furniture.

SPECS/FEATURES: proprietary system known as "Labflex" permits doors to be replaced with drawers, drawer spaces to be changed into cupboards, deep drawer replacements for shallow units, etc. All modifications of basic units are achieved from stock as specified, and available at future date as storage requirements and laboratories change. Sectional units permit nucleus of fully developed laboratory furnishing from this system of components.

AIA file no. 35-E

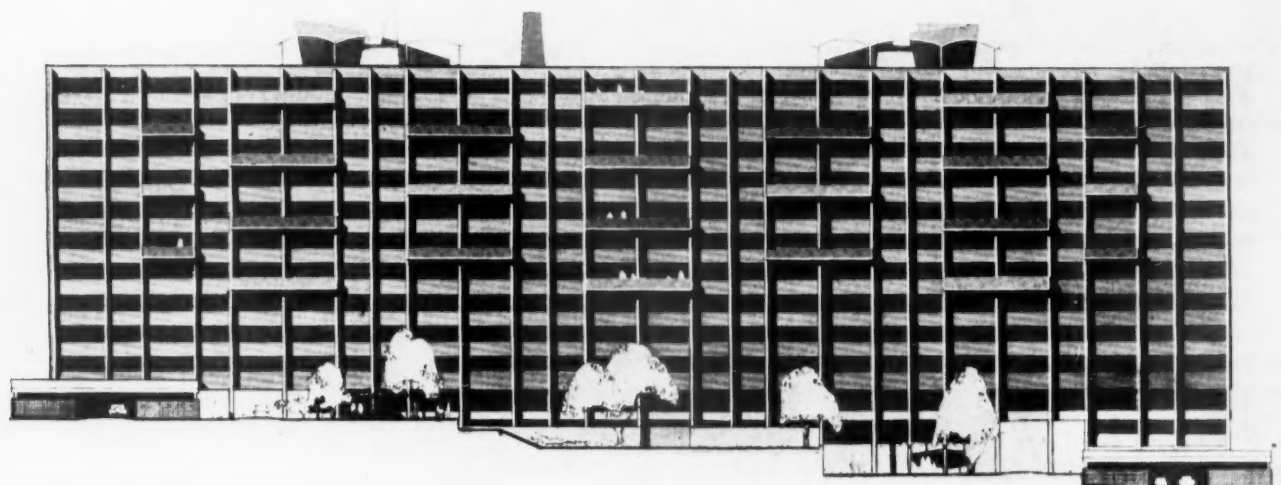
MFR: LABORATORY FURNITURE CO., INC.
Circle 183 for further information.

THE ANATOMY OF A NEW PROJECT

preview: 9

BISHOP TOWERS, NEW BRUNSWICK, N. J.
 NEW PARKWAY CONSTRUCTORS, INC.
 TURANO-GARDNER ASSOCIATES
 FRAIOLI, BLUM-YESSELMAN
 COSENTINI ASSOCIATES
 MICHAEL M. BURRIS

project
 sponsors
 architects, AIA
 structural engineers
 mechanical engineers
 site planner



General design program

The faculties of two New Jersey institutions of higher learning, Rutgers University and Douglass College, are providing the nucleus of co-operators who will own their own apartments in the Bishop Towers middle income project. To be built in New Brunswick, N. J., on an Urban Renewal site alongside the Douglass Campus, the apartments will provide every convenience for modern living.

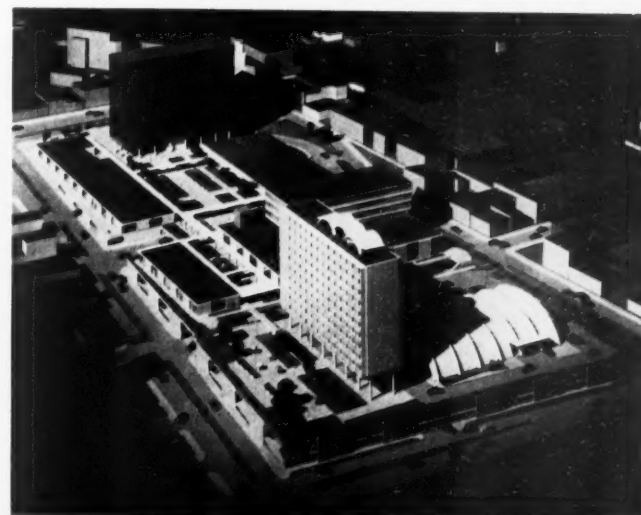
This is one of the phases in a coordinated series of projects being undertaken by the local Housing Authority and private developers with the aid of Title I of the Slum Clearance and Urban Redevelopment Act. This area of redevelopment is located in the heart of the downtown shopping and business districts of New Brunswick. The construction of a low-rent housing project of 4 nine-story fireproofed apartment buildings occupying two city blocks is already completed, while the cooperative housing project is in the planning stage. Also planned is a "Little Rockefeller Plaza" (see illustration) covering four city blocks and consisting of a 12-story office building, a luxury hotel with ballroom and convention facilities, department stores, supermarkets and retail stores of every type. All this will be built on a landscaped plaza which is the roof of a partially underground parking garage for 2,000 cars. Future planning includes the redevelopment of a total of 37 city blocks in the downtown area of New Brunswick. The end result will be a coordinated and controlled master plan for a central city to fill the needs of a growing America.

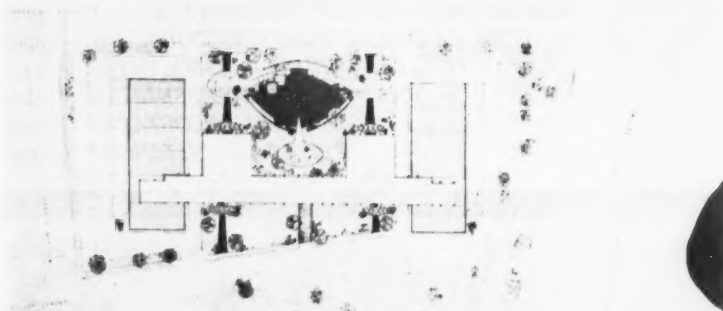
Plan elements

Ground breaking and initial construction will begin about October of this year. The project consists of two separate but connected buildings forming two "T's." Garages are located at each end for 50 per cent of the cars, and

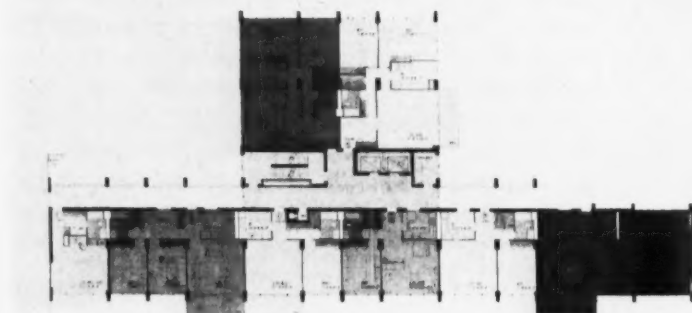
(Continued on page 28)

Elevation of Bishop Towers apartments (above). Also planned in conjunction with the cooperative housing project is a "Little Rockefeller Plaza" (below) covering 4 city blocks and consisting of an office building, a luxury hotel, department stores and other retail facilities.





Site plan (above) provides garages and on-site parking. A system of one way drive-ways controls vehicular traffic to all areas. Sitting and recreational areas for all age groups are also provided. Plan (below) of typical floor is one-half of total area. Right-half of the building is shown with apartment arrangements.



the others are also parked on site. A system of one way driveways controls the vehicle traffic to the parking areas, garages and lobbies of the buildings. The entire sitting and recreational areas were designed and treated as imaginative playscapes, coordinated and correlated to age-level needs.

The architects sought to avoid the institutional, dull or unappetizing appearance characteristic of many general housing developments by concentrating on designing for the ultimate in modern livability and visual pleasure.

General features

All apartments are accessible by a private entrance from a solar screened gallery. Through-ventilation was also a major consideration. A maximum of light and through-ventilation assures comfort and cheerfulness to all units. All the apartments were designed with extra-large living rooms (260 sq. ft.) and minimum bedroom dimensions of 11'-6". Some of the units have included an area for quiet study.

The building includes ten typical floors, consisting of two efficiency units, 6 one-bedroom units, 6 two-bedroom units and 2 three-bedroom units for a total of 160 dwelling units.

The upper ground floor level (near Neilson St.) includes a lobby, covered sitting and play areas for shady and rainy days, a pram storage room and 13 additional efficiency units.

A mezzanine level includes a superintendent's apartment, community and office facilities, and the general storage areas. The lower lobby level includes again the covered sitting and play areas, plus the mechanical equipment areas. Fifty per cent of all apartments have balconies—children can also play on the galleries. There is a choice of any apartment, with or without a balcony.

The roof areas are utilized within the over-all design considerations. Covered sitting areas, unusually shaped, are included. Elevator penthouses were developed through analyzing the basic function of the machines and the economy of the structure for these machines. The incinerator settling chamber's function was analyzed thoroughly and the resultant form produced an unusual shape.

Adjunct facilities include a restaurant and neighborhood shops to service the project and the surrounding areas.

Structural notes

The structure is a flat-plate reinforced concrete system, with the exposed frame on the exterior. All slabs are 6" thick, spanning a maximum of 18'-0" through the use of 3,000# concrete. All balconies are precast concrete and "glued" to brackets cantilevered from the columns by the use of epoxy plastic solidified by a polyamide catalyst. The bond obtained between the bracket and the balcony is greater than the molecular cohesive properties of the original concrete. The garage is constructed of 3" concrete arches spanning 29'-0" by 65'-0" bays, eliminating columns from all interior spaces. Garages and galleries are both enclosed by precast concrete solar blocks, also "glued" together with epoxy. The total effect will create the feeling of a light and airy structure.

Electrical notes

Apartments will have a master TV antenna system outlet in each living room and an outlet for air-conditioning units in each living room and bedroom.

Each apartment will have an individual circuit breaker type panellette for control of all branch circuiting within the apartment. Lighting fixtures will be consistent with the architectural design. Walk and garden lighting is designed to present the latest concept in outdoor nighttime lighting.

Heating and ventilating

The heating system consists of hot water baseboard radiation system with automatic zoning for exposure and includes thermostats for individual heat control.

The hot water system is designed as a complete reverse return cycle which inherently maintains the entire system in balance to create uniform heating throughout all floors at the same time. Baseboard covers across the balcony openings were designed to support the occupants as they cross them.

All interior kitchens, toilets and living space are provided with special exhaust systems.

Plumbing and related information

All kitchens have built-in ovens, counter-top ranges, exhaust hoods and garbage disposal units. The sloping site permitted the consulting engineers to design all piping along the ceilings of the ground floor areas, making all mechanical systems easily accessible for minor and major repairs and maintenance.

Costs

General construction	\$1,742,900.00
Heating	\$171,500.00
Plumbing	\$181,000.00
Electrical	\$167,000.00
Total	\$2,262,400.00
Total gross floor area	200,400 sf
Total gross volume	1,789,000 cf
Cost per square foot	\$11.50
Cost per cubic foot	\$1.28

literature

Literature cited in this department is available from various manufacturers and associations free of charge. To obtain copies, circle the keyed numbers on the reader service cards facing pages 8 and 32.

Marble/granite reference

Marble and Granite Source Book contains individual data sheets on several varieties of marble and granite affording descriptions, specifications physical properties, strength ratios, hardness characteristics, densities and photographs. Sheets are bound in three ring binder, suitable to receive additional sheets as they become available each month.

AIA file no. 22

MFR: VERMONT MARBLE CO.
Circle 184

Aluminum facilities

Recent brochure is institutional presentation of history of *Anaconda Aluminum*. Facilities and processes are described for primary aluminum, wrought aluminum products, aluminum and laminated foil, and aluminum wrappings and containers. (16 pp.)

AIA file no. 15-J

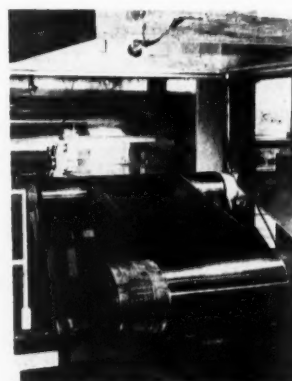
MFR: ANACONDA ALUMINUM CO.
Circle 185

Insulation problems

Seven Modern Ways to Pinpoint Your Insulating Needs enumerates precise solutions required for individual insulation problems. Pamphlet may be an aid in specifying types of insulation tailored to all types of home construction. Covered are specific insulation problems connected with furred masonry, crawl spaces, moisture control, mild climates, wall and ceiling use, ceiling use alone and high-performance demands. Detailed diagrams show *Alfol* insulation installations to meet each of these needs. Comparisons are made between insulation performance during the summer and winter.



184



185



186

Costs of obtaining a full-efficiency material are also discussed.

AIA file no. 37

MFR: REFLECTAL CORP., SUBS. OF
BORG-WARNER CORP.
Circle 186

HVAC

Steel enclosures

Custom-built steel enclosures for air conditioning and blender units, convectors and radiators, are described in current pamphlet. Section drawings and photographs show standard enclosures and variations. Specifications and other data is presented. (8 pp.)

AIA file no. 16

MFR: S. H. POMEROY CO.
Circle 187

Draft control handbook

Recent handbook outlines problems encountered in venting combustion equipment when using existing chimneys and flue connections. *Shur-Flo* draft inducer is described as practical solution to problems. Capacity and performance of unit are stressed, as well as common causes of chimney failure. (16 pp.)

AIA file no. 30-G-3

MFR: WALKER MFG. AND SALES CORP.
Circle 188

AC directory

July to September edition of the *Directory of Certified Unitary Air Conditioners*, provides ARI rating data on 1,611 models of 41 of the 47 companies participating in ARI's Unitary Air Conditioner Certification Program. Models covered include all types of central residential air conditioners and

many unitary packages used in commercial and industrial establishments, but not room air conditioners, heat pumps or large field-assembled systems. Top capacity of units is 135,000 BTU/h. (57 pp.)

AIA file no. 30-F

ASSN: AIR CONDITIONING AND REFRIG-
ERATION INST.
Circle 189

Air mover

Recent catalog-folder contains complete specifications, dimensional data, velocity graphs and description of the low silhouette design of *Wausau Air Mover*. Illustrations show testing and rating procedures for units. (12 pp.)

AIA file no. 30-D

MFR: GREENHECK FAN AND VENTI-
LATOR CORP.
Circle 190

Cooling towers

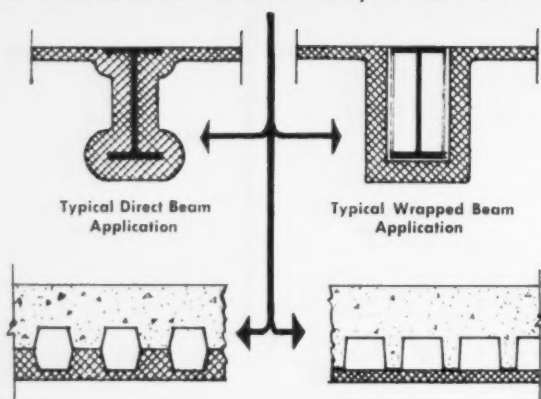
Catalog no. 362 describes line of *Econo-Mizer* cooling towers. Units feature unique plastic horizontal deck, making possible size and weight reductions of 50 per cent. Complete construction, capacity and design data is provided. AIA file no. 30-F-3

ACME INDUSTRIES, INC.
Circle 191

Temperature control

Straightline room thermostats for heating and cooling applications, are described in bulletin GED-3585A. Performance characteristics, installation and wiring diagrams and rating of popular controls are given, in addition to unit features, including unobstructed face for easier reading at greater distances, ease of installation,

FIREPROOFING



Typical Cellular Deck Application

that pays off!

FOR THE ARCHITECT . . .

light weight, direct application, space saving, good acoustical absorption, complete ceiling design freedom.

THE GENERAL CONTRACTOR . . .

one application by one trade in one coat completes job fast; clean application; all weather application.

THE OWNER . . .

early occupancy, permanent, high acoustical absorption, high thermal insulation, proved efficiency.

This is an economical, machine-applied, Underwriters' Laboratories tested fireproofing system for cellular steel floors and structural steel beams, girders and columns. CAFCO BLAZE-SHIELD fireproofed buildings include: Union Carbide Building, New York; H. K. Porter Building, Pittsburgh; National Cash Register Building, Chicago; Metropolitan Life Insurance Building, Ottawa.

For further information send for Bulletin F-10.



Subsidiary of United States Mineral Wool Company

STANHOPE, NEW JERSEY

Other CAFCO products:
SOUND-SHIELD—For Acoustical Treatment
HEAT-SHIELD—For Thermal Insulation

Circle 116 for further information.

literature

modern appearance and less sensitivity to vibration and position. (4 pp.)
AIA file no. 30-E

MFR: GENERAL ELECTRIC CO.
Circle 192

Low pressure units

Bulletin 9127 describes an improved line of low pressure *American Blower Inductor* air conditioners for perimeter air conditioning of multi-room buildings. Tabular data presents such information as heating coil capacities, gravity heating capacity, hot water and steam heating capacity factors and water friction for various delivery volumes. Dimensional data is also provided. (8 pp.)

AIA file no 30-F

MFR: AMERICAN STANDARD INDUSTRIAL DIV.
Circle 193

Winter ac units

Illustrated catalog sheets describe design and engineering features of oil and gas fired *Blue Ribbon* winter air conditioners. Colors, specifications, finishes, etc., for *LHO* (oil) and *LHG* (gas) units are enumerated. Ten year guarantee is offered on heat exchanger. (2 sheets)

AIA file no. 30-F

MFR: THATCHER FURNACE CO.
Circle 194

Low velocity air diffusers

Technical folder is available, describing five basic types of low velocity air diffusers. Details give nominal sizes, CFM capacity ranges, special features and applications for each. Included is description of *Multi-Vent Troffer*, combination air diffuser and flush-mounted ceiling fluorescent light fixture.

AIA file no. 30-D

MFR: MULTI-VENT DIV., THE PYLE-NATIONAL CO.
Circle 195

Radiant heating

Radiant Heating Slab Construction is designed to aid architects, engineers and others concerned with accepted installation procedures for radiant heating systems. Contained are sketches of types of radiant heating

slab construction, showing position of wrought iron pipe coils in concrete slab, and relationship of coils and slab to structural features of on grade and above grade construction. (8 pp.)
AIA file no. 30-C-44

MFR: A. M. BYERS CO.
Circle 196

LIGHTING

Floodlighting catalog

Bulletin 2714 is miniature, pocket-sized edition of former full-sized floodlighting catalog. Included is such information as selection of equipment, general purpose floodlights, heavy duty floodlights, mercury vapor units, special floodlights, lighting for hazardous locations, searchlights, underwater lighting, floodlight poles, accessories, installation suggestions and lighting calculations. (184 pp.)

AIA file no. 31-F-22

MFR: CROUSE-HINDS CO.
Circle 197

Lighting catalog

Catalog no. 115 covers lighting line, including canopy units, exit signs, commercial and industrial hangars, industrial fixtures, troffers and wall units. Photographs and diagrams are provided, in addition to dimensions of all units. Mfr stresses that catalog contains only condensed listings of fixtures, and that many modifications and variations are also available, in addition to mechanical specifications and photometric data. (34 pp.)

AIA file no. 31-F-23

MFR: DAY-BRITE LIGHTING, INC.
Circle 198

Self-adjusting troffer

Telescopic door frame which automatically adjusts to a perfect fit, 4 15/16" recess and wire access door big enough to reach into, are among features attributed to *Speedomatic* troffers by mfr. Folder, intended for architects, engineers and other lighting specifiers, lists absence of mechanical catches, large end openings for continuous wiring, integral mounting brackets with no loose parts, rotating door frame end caps designed to permit shielding replacement by turning only one fitting and double lead screws that level troffer to ceiling line in seconds from below, as characteristics of units which facilitate installation. Included also are thirteen inserts which describe spot boxes,

various shielding media and *Ceiling Index*, reference sheet listing popular ceiling systems and proper *Speedomatic* troffer for each system. Four basic types available. (folder with 13 inserts)

AIA file no. 31-F-23

MFR: SMITHCRAFT LIGHTING
Circle 199

Luminous ceilings

Honeylite luminous ceilings are described in series of six specification sheets, recently made available. Included are features of units with own suspension system, lighting properties and visual comfort index (VCI) for 100 footcandles. Units are UL approved, lightweight aluminum. (6 sheets)

AIA file no. 31-F-231

MFR: HEXCEL PRODUCTS, INC.
Circle 230

SYSTEMS/CONSTRUCTION

Window wall system

Brochure is available, giving structural details on *Ador-Wall*, window wall structural system. Unit's versatility permits flexibility in use of either fixed glass or horizontal sliding windows; sliding glass doors or narrow-style swinging doors and use of special mullion and corner extensions. Typical applications are included. (8 pp.)

AIA file no. 17-A

MFR: ADOR CORP.
Circle 201

Solar screening

Current brochure illustrates combinations of *Sol-R-Wal* solar screens from six basic forms. Suggestions are included for solar screen walls and panels, showing product's flexibility in providing many patterns that can be employed as space dividers, privacy screens, garden walls and equipment enclosures. (4 pp.)

AIA file no. 29-B-6

MFR: MALVERN FLUE LINING, INC.
Circle 202

Concreting procedures

Manual of Recommended Practice for the Production, Delivery and Use of Ready Mixed Concrete contains suggested procedures for facilitating working relationships between producers, contractors, architects and engineers. It covers all aspects of

concreting from writing specifications through placement, with the intention of making possible more efficient ordering and delivery procedures. Price is \$1.00. (11 pp.)

AIA file no. 4

ASSN: THE CONCRETE INDUSTRY BOARD, INC.
Circle 203

Wood construction

Bulletin no. 38 reviews and summarizes improved fasteners for better utilization of wood. Includes annular and helical threaded bright and hardened nails, wood screws and sheet metal connectors. Improved assemblies and designs of nailing procedures are also contained. Bibliography presented. (44 pp.)

AIA file no. 35-i-17

ASSN: WOOD RESEARCH LABORATORY, VIRGINIA POLYTECHNIC INSTITUTE
Circle 204

Roof deck material

Recent data sheet describes *Insulite* roof deck, for use in homes and other light construction with the open beam style of design. Product is presented as: structural decking; insulation; vapor barrier and finished ceiling. Examples of usage are provided. (4 pp.)

AIA file no. 19-D

MFR: INSULITE DIV., MINNESOTA AND ONTARIO PAPER CO.
Circle 205

Timber construction

Pamphlet featuring church design with engineered timber construction has been released. Several church structures are shown, which utilize wood components. Method for designing Tudor arch is presented, in addition to information on *Tim-Deck*, sheathing-insulating-ceiling material. (12 pp.)

AIA file no. 19-B-3

MFR: TIMBER STRUCTURES, INC.
Circle 206

Tubular scaffolding

Catalog no. 62 describes the patented panel and brace locking mechanisms of tubular steel scaffolding line. Product is illustrated in use for masonry, shoring and various other scaffolding applications. Product specification data and safety rules covering scaffold installations are included. Accompanying Bulletin No. 69 contains illustrations

of completed construction projects, in which product was utilized. (12, 8 pp.)

AIA file no. 36-E

MFR: BEAVER-ADVANCE CORP.
Circle 207

Concrete forms

Information, including specifications, on *Fiberglas Form Boards*, for use with lightweight, aggregate concrete roof deck constructions, is presented in recently published supplementary data sheet. Material is reputed to serve as efficient thermal insulator, sound absorber and fire-safe interior finish. (single sheet)

AIA file no. 4-D

MFR: OWENS-CORNING FIBERGLAS CORP.
Circle 208

Vertical furring supplements

Technical Bulletin Supplements 14-1 and 14-2, designed as aids for writing metal lath and plaster specifications, are now available. Supplements provide information related to stiffeners, direct wall furring, ceiling attachments, door bucks, floor attachments and shafts and similar enclosures which can be plastered only from one side. (2 sheets)

AIA file no. 20-B-1

ASSN: METAL LATH MFRS. ASSN.
Circle 209

ALUMINUM UNITS

Aluminum rivets

Recent folder, Form 8-457, describes *MS* aluminum self-plugging blind rivets. Technical information, covering material specifications, shear and tension strength values, hole size recommendations and shop practice notes, is provided. Line drawings give typical applications. (4 pp.)

AIA file no. 13-C-1

MFR: HUCK MFG. CO.
Circle 210

Store exteriors

Folder, containing series of seven pamphlets, suggests methods of improving appearances of stores and similar establishments with *Amarlite* entrances and store fronts. Units are of aluminum and are available for almost any requirements.

AIA file no. 16-E

MFR: AMERICAN ART METALS CO.
Circle 211

HERE'S NEWS

You Can Have A Complete Radiant-Acoustical Ceiling For \$1.72 Per Square Foot



James A. Phillips Co., New York City, N. Y., won the contract for the above installation with a bid of \$1.72 per square foot. Illustrated is part of 10,000 square feet of *SIMPLEX* radiant-acoustical ceiling in the new engineering offices of the Long Island Rail Road, Jamaica, N. Y.

This ceiling provides heating and cooling, ventilation, acoustical correction, support for recessed lights and a permanent, low maintenance surface (anodized aluminum).

Since the above, three other *SIMPLEX* radiant-acoustical ceilings have been installed for the L.I.R.R. as part of its rehabilitation program. More are on the drawing boards.

Radiant-acoustical ceilings need not be costly if care is exercised in selection. The *SIMPLEX* radiant-acoustical ceiling is the only one so completely integrated. It does the entire job of comfort conditioning with one medium, air. Other systems use a combination of water and air.

Complete information is available in our folder RA9. It contains complete information on design, photographs of other installations, details and working specifications.

Simplex Ceiling Corp
552 West 52 Street, New York 19, N. Y.
Circle 117 for further information.

ESTIMATES GOING HAYWIRE?

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DUSO COST CONTROL SURVEYS

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original . . . quality-built

- incandescent • fluorescent • commercial
- industrial • landscape • special project

Comprehensive, handy. Gives photometric, installation and construction data. Sent free on business letterhead request to architects, lighting engineers, contractors.

Plants and Engineering Offices
in Los Angeles and Chicago

SOLAR Light Mfg. Co.
400 N. Ashland Avenue • Chicago 22, Illinois

Circle 119 for further information.

literature

Aluminum heating units

Topical brochure lists features of aluminum water heating tanks for commercial and industrial uses. Made by Rudd, of Alcoa aluminum, tanks offer corrosion resistance, high strength, light weight, high heat efficiency and low maintenance costs. Brochure contains sizing guide for various applications of water heating models. (12 pp.)
AIA file no. 29-D-2

MFR: ALUMINUM CO. OF AMERICA;
RUDD MFR. CO.
Circle 212

Aluminum grating

Lightweight, sparkproof, non-corrosive aluminum grating is featured in current publication. Safe load tables, panel dimensions and section drawings are provided for roll-locked pressure-locked and riveted *Weldforged* grating. (8 pp.)
AIA file no. 14-R

MFR: WELDFORGED DIV., KERRIGAN
IRON WORKS, INC.
Circle 213

TILE

Tile colors

Romany Spartan Color Harmony Chart is comprehensive listing of tile colors with suggested colors for harmonizing or contrasting effects. Standard colors of porcelain, fixtures, etc., are included as well as bright, matte and crystalline glazed tiles. (8 pp.)
AIA file no. 23-A-2

MFR: UNITED STATES CERAMIC TILE
CO.
Circle 214

Tile booklet

Comprehensive booklet of the American-Olean Tile Co. includes information on its line of glazed and unglazed ceramic tile products. Charts provided give tile types, physical description and suggested uses. Color charts are available and present available colors for glazed interior tile, *Crystalline Glazed* tile and unglazed tile. Installation methods are discussed, together with detail drawings showing interior tile installation. Trim for standard and unconventional

installations is offered in varied dimensions. (32 pp.)
AIA file no. 23-A

MFR: AMERICAN-OLEAN TILE CO.
Circle 215

Decorative tile uses

Acoustical and decorative ceiling tiles for interior, residential installations are described in a brochure from *Insulite*. *Look Up to Beauty* contains colored illustrations of tile uses in bedrooms, kitchen and dining rooms.

AIA file no. 39-B

MFR: INSULITE, DIV. OF MINNESOTA
AND ONTARIO PAPER CO.
Circle 216

Ceramic tile

Ceramic tile for residential, institutional and industrial construction, is the subject of current literature. Booklet, in addition to photographs and listing of recent installations, contains tabular data on descriptions, shapes and sizes, thicknesses and typical uses of glazed interior tile, *Flortex* glazed floor tile and crystalline glazed tile. Color chart is included, with specifications. (8 pp.)

AIA file no. 23-A

MFR: ROBERTSON MFG. CO.
Circle 217

Large size tile

New Interiors with Large Size Ceramic Tile, presents photographs depicting various institutional and residential applications of ceramic tile in 6" x 4 1/4" and 8 1/2" x 4 1/4" sizes. (16 pp.)
AIA file no. 23-A

MFR: AMERICAN-OLEAN TILE CO.
Circle 218

Tile specifications

American Standard Assn. specifications for glazed ceramic wall tile, ceramic mosaic tile, quarry tile and pavers installed in Portland cement mortars are now available. Specifications supersede *Tile Handbook*, issued in 1951.

AIA file no. 23-A-2

ASSN: TILE COUNCIL OF AMERICA, INC.
Circle 219

FLOORS

Floor styling handbook

Vina-Lux Floor Styling Handbook contains over 40 floor design possibilities.

Contained also is information on using color and design effectively, planning floors for rooms of any type or size and advantages of tile. Color charts and sample patterns are presented. (16 pp.)

AIA file no. 23-D

MFR: AZROCK FLOOR PRODUCTS DIV.,
UVALDE ROCK ASPHALT CO.
Circle 220

Durable concrete floors

Illustrated bulletin describes *Masterplate Iron-Clad* concrete floors, said to last six times longer than other concrete floors. Industrial floor features such as: wear and corrosion resistance, static-dissemination, economy, spark resistance, etc., are discussed. Photographs and diagrams cover installation methods. (24 pp.)

AIA file no. 4-E-6

MFR: THE MASTER BUILDERS CO.
Circle 221

SEATING EQUIPMENT

Movable/permanent

Mechanical, folding bleachers, folding chair stands, folding wallseats, portable bleachers, permanent grandstands and assorted types of basketball backstops are included, with construction features and architectural specifications, in recent bulletin. All metal types are available, some in aluminum. Detail drawings and charts of dimensions and capacities are presented, in addition to photographs of typical installations. (12 pp.)

AIA file no. 13-J-1

MFR: BERLIN CHAPMAN CO.
Circle 222

Folding stages

Portable, folding stages and steps, designed to save space in institutional and commercial areas such as classrooms, banquet halls, hotels, offices and churches, are treated in recently published pamphlet. Illustrations show unit features, including steel understructure, laminated fir board construction and hard rubber wheels. AIA file no. 35-A-1

MFR: HORN DIV., BRUNSWICK-BALKE-COLLENDER CO.
Circle 223

TESTING/MAINTENANCE

Maintenance guide

Maintenance guide, describing maintenance and refinishing methods for

most types of laboratory work surfaces, is currently available. Various top finishes, cements and air dry enamels available are described with prices. Commonly used laboratory service fixtures are included. (6 pp.) AIA file no. 35-E

MFR: KEWAUNEE MFG. CO.
Circle 224

Subsoil investigation

Catalogs B-7 and S-58 deal with soil and subsoil investigations for foundations. Sections treat of reasons for investigation, methods, exploratory borings, laboratory testing and reports. Information on pile foundations, prestressed concrete, caissons, underpinning, heavy construction and pipe lining is also provided. (12 and 20 pp.) AIA file no. 1-D

MFR: RAYMOND CONCRETE PILE CO.
Circle 225

Consolidation test apparatus

Bulletin on consolidation test apparatus is offered, describing types of loading devices used for consolidation testing of foundations under bridges, dams, etc. Included is description of *Levermatic*, table model, which applies a load of 20 tons/sf on a 2½" diameter specimen. Accessories such as specimen trimmers, loading weights, porous stones and data sheets are also contained.

AIA file no. 1-D

MFR: SOILTEST, INC.
Circle 226

Silicone treatments

Catalog listing silicone products and uses has recently been made available. Included in uses are: rubber products, including RTV (room temperature vulcanizing) silicone rubber; cosmetics and polishes; electrical insulation; water repellents; textile finishes; lubricants, and release and anti-foam agents. Publication includes additional specialized literature covering product and application information. (8 pp.) AIA file no. 3-B-1

MFR: GENERAL ELECTRIC CO.
Circle 227

INSULATION

Plastic insulation

Two booklets describe *Scorbord* and *Roofmate*, insulating materials. For-



**THESE
STEPS
LEAD
TO THE
MODERN
ROOF-
ACCESS
DOOR**

Interior ladder access to the roof, on single-story as well as multiple-story buildings, adds up to convenience and safety your clients will appreciate. BILCO scuttles help you to achieve those "clean" building lines, lock securely, give only authorized personnel an easy route to and from the roof in all kinds of weather.

BILCO roof scuttles combine rugged construction, weathertightness, effortless operation, the safety of one-hand opening and closing, to insure lasting satisfaction. Available in standard and special sizes in a variety of materials to fill your every requirement.

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HORIZONTAL SPRING-OPERATED DOORS

The Bilco Co., New Haven, Conn., Dept. A19

Please send me your new catalog on special service doors.

Name

Firm

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City State

Circle 120 for further information.

mer is rigid plastic foam insulation board for perimeter and foundation use, as well as cavity wall insulation. Latter is board material, enclosed in asphalt laminate Kraft wrapper, designed for insulation under built-up roofs. Booklets contain data on heat transmission, recommended thicknesses, installation, compression and specifications. (each 4 pp.)

AIA file no. 37-B-3

MFR: DOW CHEMICAL CO.
Circle 228

Pipe insulation uses

Pipe Insulation News, Spring 1959 edition, contains articles devoted to applications of *Gilsulate* insulation for underground pipes. Applications at Brandeis University are cited. Includes information also on structure of insulating material, available types and protection afforded. (4 pp.)

AIA file no. 37-B

MFR: GILSULATE DIV., AMERICAN GILSONITE CO.
Circle 229

Insulation guide

New Directions in Sidewall Insulation, treats of the ability of recently developed insulating materials and techniques to reduce home construction costs. Innovations in insulation practices are the result of air conditioning, higher inside humidities, growth of electrical heating, etc. Pamphlet shows the impact of these factors upon insulation problems.

AIA file no. 37

MFR: REFLECTAL CORP., SUBS. OF BORG WARNER CORP.
Circle 230

MISCELLANY

Indoor/outdoor clocks

Recent bulletin presents additional models of *Eltimeco* skeleton dial clocks for both indoor and outdoor installations. Information detailing features, advantages, materials and finishes is provided, in addition to charts giving dimensions and mounting information. (4 pp.)

AIA file no. 31-i-23

MFR: ELECTRIC TIME CO., INC.
Circle 231

Parking templates

Parking lot layout templates, suitable for use in planning practically any type of parking arrangement, are now available. Scaled 1" to 20', and 1" to

50', templates make provision for 45°, 60° and 90° parking. Designed to permit safe, convenient placement of maximum number of cars in any area. (6 templates)

AIA file no. 38-L-1

MFR: MAINTENANCE, INC.
Circle 232

Signaling systems

Pocket-sized resume of signaling systems, components and their application, has recently been published. Included is data on control, communication and protection equipment, general industrial signals and OEM components. Booklet is color-indexed for easy reference. (44 pp.)

AIA file no. 31-i

MFR: EDWARDS CO., INC.
Circle 233

Acoustical catalog

Catalog 60, *The Complete Line of Engineered Sound Control Products*, contains complete listing of types of industrial and business noise controls from ceilings to doors. Construction details and recommended installation, maintenance and application methods are included. Ratings are also presented. (12 pp.)

AIA file no. 39-B

MFR: ELOF HANSSON, INC.
Circle 234

Office units

Series of *Space-Saver* work stations for office use, is described in current brochure. Units are steel, and available in any convenient drawer arrangement. Complete office planning consultation service is offered to meet individual requirements.

AIA file no. 35-H-4

MFR: REMINGTON RAND DIV., SPERRY RAND CORP.
Circle 235

Fume hoods

Elevations, duct locations, roughing-in drawings, face velocities, CFM recommendations and blower data are contained in 1960 catalog, describing line of fume hoods. Clear illustrations and section drawings are presented on varied types of hoods. Service and electrical fixtures are also included. (48 pp.)

AIA file no. 35-E

MFR: KEWAUNEE MFG. CO.
Circle 236

ASTM Standards. *American Society for Testing Materials*, 1916 Race St., Philadelphia 3, Pa.

Compilation of Standards on Wood, Wood-Base Materials and Wood Preservatives, D-7, 1959, 456 pp., \$5.50.

Supersedes 1954 edition. Contains 69 standards of which 37 have been revised, have had their status changed or are new. Includes methods for establishing structural grades for wood and timbers, evaluating mechanical and physical properties of wood, methods of chemical analysis, fire tests, tests for panels for building construction, truss assemblies, glued joints, and general test methods.

Circle 237 for further information.

Building Research Advisory Board. *National Academy of Sciences-National Research Council*, 2101 Constitution Ave., Washington 25, D. C.

Criteria for Ducts to be Used in Residential Warm Air Heating and Air Conditioning Systems, NAS-NRC Publication 651, 1959, 56 pp., \$1.25.

Provides a means by which the acceptance of ducts and duct materials can be placed on a performance basis. It is an analysis of the properties needed by ducts and duct materials to assure satisfactory performance in residential applications. Suggested tests and acceptance values for these properties are included. However, they must be validated before being used.

Circle 238 for further information.

U.S. Department of Commerce. *Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.*

Research Highlights of the National Bureau of Standards (Annual Report 1958), \$45.

Illustrated report covers research program of the Bureau.

Circle 239 for further information.

Trends in Building Permit Activity, Bulletin No. 1243, 1959, 120 pp., \$65.

Prepared by U.S. Department of Labor's Bureau of Labor Statistics. Pre-

sents data on building construction authorized by local building permits, in complete detail, for years 1954-56. Shows trend of building construction in principal cities of U.S., beginning with 1949. Selected statistics for 1957-58 provided.

Circle 240 for further information.

Cast-Iron Soil Pipe and Fittings, Commercial Standard CS188-59, 1959, 48 pp., \$30.

Circle 241 for further information.

NEMA Standards. *National Electrical Manufacturers Assn., 155 E. 44th St., New York 17, N. Y.*

NEMA Standards for Room Thermostats, DC 3-1959, 1959, \$40.

Covers certain constructional details, ratings, methods of rating, sensitivity and methods of determining sensitivity of all types of a-c room thermostats, including heating, cooling, heating-cooling, and electric heating thermostats.

Circle 242 for further information.

SAMA Tentative Standards. *Scientific Apparatus Makers Assn., 370 Lexington Ave., New York 17, N. Y.*

Bimetallic Thermometers, RC4a-9-1958, no charge.

Circle 243 for further information.

Building Research Institute. *National Academy of Sciences-National Research Council, 2101 Constitution Ave., Washington 25, D. C.*

Noise Control in Buildings, publication 706, 1959, 150 pp., \$5.00.

Report on discussions and conclusions of 1959 BRI conference on noise control. An objective analysis of the problem published by BRI under sponsorship of ten building industry firms.

Circle 244 for further information.

Field Applied Paints and Coatings, 150 pp., \$5.00.

Contains the complete report of the BRI conference on this subject held last December.

Circle 245 for further information.

A/E NEWS welcomes the opinions of its readers. Letters should be addressed to: Editor, Architectural and Engineering News, 452 Fifth Ave., N.Y. 18.

National archive

Editor:

In reading the editorial "For a National Archive" in your July 1959 issue we can only suppose that you do not know about the Historic American Buildings Survey. This was begun nearly 26 years ago and is probably one of the largest collections of its kind anywhere. The Survey was not a new concept in 1933, but it was the first venture of the Federal Government in this field and it was designed to be used by the general public. It is now so well used, in fact, that the Library of Congress sells more copies from HABS than from anything else they have.

I don't believe that a great deal has been done about 35 mm. slide copies of HABS material but the American Microfilming Service Co., 44 Laura Street, New Haven, Conn. is studying the possibilities of reproducing the whole thing in miniature on file cards. We have just had it done ourselves for all records from the State of Pennsylvania.

A current large-scale project built around slides is the operation underwritten by Carnegie Corporation and directed by Professor William Pierson of Williams College. They are selling color slides of a large collection of new photographs of early American art, including architecture. . . .

Thanking you for your consideration, I am

Sincerely yours,
Charles E. Peterson
Supervising Architect
Historic Structures
Eastern Office, Division
of Design and Construction
U. S. Department of Interior
National Park Service
Philadelphia, Pa.

Editor's note: Mr. Peterson's point is well made. However, we were not concerned only with historic structures. We are interested in seeing the creation of an archive based on significant contemporary work of the past three decades. Certainly, the Historic American Buildings Survey is performing a monumental task by its long-range program for assembling an archive of Early American Architecture. It was begun in 1933 by architects of the National Park Service of the U. S. Department of the Interior in cooperation with the AIA and the Library of Congress. To date, 25,600 drawings and 29,200 photographs of 7,600 structures have been assembled—representing one of the largest collections of its kind.

(Continued on page 36)

ONCE OVER LIGHTLY

Urban sprawl: *Life Magazine* is to be commended for its recent article, *A Plan to Save Vanishing U.S. Countryside* by William H. Whyte, Jr. Mr. Whyte, editor of the book, *The Exploding Metropolis*, which dealt with the rapid growth of American cities, takes a hard, critical look at the disease of urban sprawl and its destruction of our open spaces. He discusses the effects of speculative building, the chewing-up of the countryside by bad planning and building practices and he offers a constructive plan of action based on a creative program of securing easements.

While the easement device is not new, author Whyte cites examples of its current application by communities around the nation in preserving land values and in providing for a more handsome development of building sites. His comments are very timely in view of the predicted housing building boom which will be the most spectacular phenomenon of the coming decade.

An estimated 2 million houses will be built each year of the sixties. According to projections developed by *Fortune* magazine, total annual expenditures for building new houses and apartments and for maintaining, operating, and furnishing existing ones will reach \$168 billion in 1970. Our population, according to conservative figures is expected to reach 210 million by that time.

Surely, now is not too early for the architectural and related professions to measure the physical effect this tremendous, and certainly most fortuitous, outpouring of productivity will have on the appearance of our cities and our countryside. Leading members of the profession have pointed to the need for the greater participation of the architect in developing a more beautiful America. The dimensions of the good work to be accomplished in educating the public to the bad effects of poor planning and the ultimate expense and hazards of urban sprawl are staggering—a dramatic challenge worthy of a great profession.

Gigantism, where is thy sting?: There are a total of 13,693 architectural firms according to the AIA-Burdell Commission Report. According to our crude statistical methods, which include counting on ten toes as well as ten fingers, that leaves about 13,593 firms who didn't make the list for business hypothyroidism. Not that we are "agin" the top ten or top hundred of anything, but we have always felt that in areas in which intelligence and professional judgment are still a vital asset, mere size is not quite enough. The practice of architecture is still a matter of public service, private conscience and individual discernment—that is why the architectural profession is second to medicine as the profession which finds its members

overwhelmingly in private practice as *individuals*—and with ethical standards second to none.

If we use size and volume as the criteria for judging the importance of a practice, we negate the most precious characteristic of professional service—the personalized integrity of its *quality*. Quality—a rare commodity these days, like all good things—still comes in small packages.

Housing our senior citizens: In this decade growing recognition is being given to the needs of varied segments of our population. Among these groups receiving greater and much needed attention is that of citizens who have passed their sixth decade—whom we have come to call our *senior* citizens. Programs are being developed everywhere to give people in this age group a new lease on *living*—in terms of recreation, social activity, leisure-time use and *housing*.

A great deal of credit for focusing interest on the housing needs of the elderly belongs to the President's *Federal Council on Aging* which was instituted with the express purpose of investigating the specialized housing requirements (among other needs) of this group of the nation's citizens. This group alone is expected to represent 30 per cent of our total population by 1970.

We are advised by Neil A. Connor, AIA, Director of the Architectural Standards Division of the *Federal Housing Administration*, that that agency is contemplating a separate set of standards for elderly housing soon, in order to eliminate the need for cross-referencing and to cover conditions encountered by the *FHA* in its experience in this specialized field. The publication of such a standard will provide an excellent tool and source of experience for architects in coping with this vital area of shelter design.

That Belgian Architect: The *Associated Press* reports that Guy Capare, architect in Loverval, Belgium, went to jail rather than pay a 40-cent fine for a traffic light violation. When he made his decision, architect Capare urged everyone who thought the sentence unfair to send him a contribution in jail.

When he got out, he said he received \$500. He donated the money to a charitable organization. He also came out with a critical six-page report on conditions in the jail. He then sent it to the minister of justice. *Humph!* Just like his architectural cousins everywhere: no compromising principle over money, giving away money received, and writing a *critique* of the experience. Well, you can never keep a good man down! JJC

abstracts

Design, discipline and dogma

From a critique by Samuel T. Hurst, AIA, Dean of School of Architecture & Arts, Alabama Polytechnic Institute, of the convention of the American Institute of Architects, June, 1959, New Orleans.

"It is a simple fact of life that thinking man continually seeks justification of his works; justification to himself, to those whom he serves, to that higher purpose in his life which he feels and may call God. Justification is necessary in any personal or social order based upon responsibility of choice and action. Where choice is unavoidable, choice begets action. Action risks success or failure and is accompanied by responsibility. Where responsibility is great, justification becomes urgent. It poses for man the great life question of *why*, why be, why work, why serve; for us the questions why design, why design as we do design? . . .

"You have heard clear statements from some of our profession's ablest individuals and have seen here exciting evidence of their work. They have been justified by recognition and indeed almost sanctified by successions of followers. It is not my purpose to evaluate their contributions but rather to call us back to look at some of the troublesome realities of here and now, to observe a few things and to launch a few ideas, simply if possible, not in the elliptical phrases which so often characterize our pompous utterances.

"No profession can, I submit, be justified by the exceptional performance of its ablest men. My concern is for the norm of ordinary practice and ordinary architects, and for the philosophy and method, or lack of it, which predestines so much of our effort to mediocrity.

"And my concern is with that body of sensitivities and disciplines which can produce a whole building and make architecture a reasonable Art, available and useful to all men. . . .

"I believe that architecture is sufficiently mature to be characterized by a coherent body of ideas, principles and practices. I believe that a method may be taught by means of which phi-

losophy can be put to work. Without philosophy and method clearly recognizable and broadly practiced our professionalism is a hollow illusion. . . .

"I have spoken of the Architect's retreat from greatness. Perhaps it is better to call it a retreat from responsibility. . . .

"I offer several explanations for what I term our retreat from greatness; they fit a pattern, a pattern of drastically altered relationship of Architect to social and political life and to the size of the job to be done. . . .

"While the demands upon his performance were increasing, he formalized his education at the Academy, out of the main stream of social and technical change and encouraged the separation between Conception and Planning on the one hand and Execution and Construction on the other. In establishment of the professional role of man of service, he gave up the equally vital role of man of building. This kind of half man was perhaps adequate to the eclecticism of the 19th and early 20th century. He was most inadequate to cope with the explosion of new concepts, problems and opportunities which followed.

"A new technology came, let us admit from the engineers—Roebbling, Paxton and others, and a new aesthetic came, from the cubist painters and constructivist sculptors and the two are only now beginning to meet. Missing still was a most essential third element, a new humanism which would remind us that architecture was for man, for man feeling, hearing, fearing, smelling, touching and loving as well as seeing, a new humanism which could put structure and aesthetics in proper relationship to man, which could assimilate the meaning of Freud and of Thoreau when he wrote; "when the farmer has got his house, he may not be richer but the poorer for it, and it be the house that has got him. But lo, men have become the tools of their tools. The man who independently plucked the fruits when he was hungry is become a farmer; and he who stood under a tree for shelter, a housekeeper."

"Finally, while knowledge of the physical and social sciences expanded

at a staggering rate, telling us things about man of which we formally only dreamed, Architecture indulged itself in over-specialized education, dispensed too liberally by underqualified and underpaid teachers.

"So I say that the Architect's retreat from greatness is his failure to grow in relation to the job to be done. . . . We have had to assume new areas of responsibility before we were ready to discharge them. We have in short, been too busy to be educated, too wise to need research, too arty to admit the engineer to our inner sanctum as a creative equal, too intuitive to submit to a systematic design procedure, and too good at selling to feel it necessary to improve our product. . . .

"These consequences, I believe, need not be. Creativity is not slave to whimsy, instead it is the concerted response to intuition and experience, sensory, emotional and intellectual, disciplined by purpose, guided by intellect and justified by use. A systematic design procedure can exist, not guaranteeing our common genius, but increasing the chance for good work by ordinary men. Such a procedure has four stages; you may rename them, sub-divide them, or rearrange them, but essentially they are adequate to the design process. These are Interpretation, Ideation, Comprehensive Analysis and finally Dynamic Synthesis, as each design element reacts to the other and they are put together in a satisfactory equilibrium of interests to form a whole. Philosophy is at work at every stage as values are assigned, principles invoked and discipline applied. . . .

"I have tried to say that good discipline becomes bad dogma only as we let it. Discipline is humble, honest, expansive in its effect, encouraging us to go out on a limb and perhaps to live there. Dogma is arrogant, restrictive, inhibiting in its effect, requiring us to be overly cautious, circumspect, often just average and above all secure. It restricts the creative process to the popular service of man. Ours is a responsibility to practice discipline and to defend it against over-riding dogma in those enterprises in which we together are engaged."

communications

(Continued from page 35)

Editor:

. . . Your point about the need for a 35 mm. film-slide archive [Editorial: July, 1959] is, of course, very well taken. . . . The AIA has recognized this need and has taken steps toward filling it—but they are small steps, I fear. It would be a really major undertaking to build up a national archive such as your editorial suggests. Not that I disapprove of it, for I think it would be wonderful. But at present we do not seem to be geared to do it. It may also be that something broken down on a regional basis might serve the public better. Possibly it is something which the Museums and possibly libraries of many cities should take up with the cooperation of the AIA.

Yours sincerely,
Joseph Watterson, AIA
Editor
Journal of the AIA

Comment

Editor:

. . . I have been reading each issue of the A/E News from cover to cover: something I never do with the numerous other architectural periodicals I either take myself or see in the University library. Partly this is due to the compactness, directness and leanness of your presentation. It is also due to the variety and scope of coverage: Forecast, Gazette, A/E News, Research Roundup, Books, Names, Abstracts, and many more. I congratulate you on the prodigious achievement of getting so much information across so compactly, effectively, and in such handy form. I commend the annotation of new products, equipment and materials and the listing of manufacturers' current literature. Both the Preview "Anatomy of a New Project," and the technical reporting on some new structural or materials consideration featured in the Digest are outstanding. These last two coverages I find particularly useful and informing—up-to-date and authoritative—to me as an architect; and I know they will likewise be valuable to my students when classes resume this fall. . . .

Sincerely yours,
John F. Fitch III, AIA
Chairman Department of
Fine Arts
Colgate University
Hamilton, New York

Acknowledgement and thanks

Editor's note: Our attention has been brought to the omission of the name of Katherine Young of New York as the portrait photographer of Messrs. Voorhees and Walker (Names: July, 1959). We wish to take this opportunity to credit and thank Miss Young for her excellent work.

Aluminum Construction Manual

The Aluminum Assn. New York, 1959. 392 pp. \$3.00.

This manual provides in a single volume data of interest to architects and engineers concerned with stressed aluminum structures. Presented for the first time are computations of allowable loads for beams and columns of aluminum alloy 6061-T6, one of the most widely used aluminum structural alloys.

Intended primarily as a reference work, the contents are arranged in five parts. The first part relates to available aluminum structural shapes, giving dimensions, weights and properties. Included are the standard tolerances and miscellaneous data necessary for designing and estimating.

Part two covers detailing practice and data on riveted and bolted connections.

Part three covers previously unavailable material for beams and columns produced in alloy 6061-T6. The data for various types of laterally supported beams and concentric loads on columns were computed by the Polytechnic Institute of Brooklyn. The work was supervised by Dr. R. B. B. Moorman, head of the Institute's Civil Engineering Department.

The fourth section presents data on nine alloys which fulfill most structural needs. Included are specifications for structures of two commonly used alloys (6061-T6 and 2014-T6) as issued by the American Society of Civil Engineers.

The final portion of the manual is devoted to miscellaneous reference data commonly required by practicing engineers and designers.

Emphasis is made on the high strength-to-weight ratio of aluminum and the attendant economies in foundation and erection costs.

The discussion preceding the tabular data sections points out that either by rolling or extrusion, all types of structural shapes familiar to designers are available in aluminum. The adaptability of the extrusion process for the production of special shapes opens up interesting new possibilities in structural design.

(Continued on page 39)

**Dr. David Barnard Steinman, PE**

A lifetime of distinguished service to his profession has propelled Dr. David Barnard Steinman, PE, to international prominence as a master designer of bridges. Over 400 bridges, on five continents of this earth, bear testimony to Dr. Steinman's genius and widely acclaimed accomplishments. He has received awards for a brilliant record in research of the aerodynamics of bridge structures and the application of metallurgical developments to bridge construction.

Now 73 years old, the master bridge-builder modestly acknowledges the many honors his works have earned him as he still continues planning his next project, which he believes to be the most inspiring of his career—a new span across the Messina Straits, linking the mainland of Italy and Sicily, the cost of which is estimated at \$150 million.

Born on New York's lower east side, virtually within the shadow of the Brooklyn Bridge, Dr. Steinman was fascinated as a boy with the structural play of this famed bridge. Through his early formative years, this bridge served as a personal symbol of his own aspiration to become a designer of bridges. As an undergraduate, he attended The College of the City of New York where he proved a brilliant student, graduating *summa cum laude*. He received his graduate degrees in engineering from Columbia University. In addition he has received over 20 honorary degrees in science, engineering, philosophy, literature, humanities and law bestowed upon him by such universities as Bologna, Ghent, Columbia, Michigan, RPI, Loyola and others.

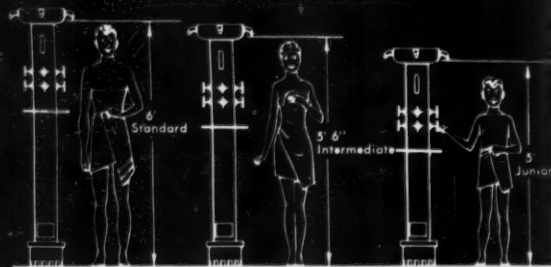
Early in his career, he designed in association with Holton D. Robinson, the winning entry for the Florianapolis Bridge competition, now the largest bridge in South America. Since then, his works have been legion, including the Hell Gate Arch Bridge, the Carquinez Strait Bridge in California, the longest cantilever bridge in the U. S.—the Mount Hope Bridge in Providence, R. I., the Tri-Borough Bridge in New York City, the Thousand Islands International Bridge, and the recently completed Mackinac Bridge in Michigan, which is five miles long.

He played a significant role in the organization of the *National Society of Professional Engineers*, and he served as first president of that society, as well as president of its New York Chapter. Dr. Steinman's illustrious career includes several years spent as Professor of Civil and Mechanical Engineering, and lecturer at leading universities and colleges. He is the author of over 750 publications, including 20 books and 600 technical papers and professional articles. His undaunted spirit and belief in the engineer's invaluable service to humanity are reflected in his 150 poems, published in four anthologies and numerous literary journals. His honors and medals, virtually innumerable, include the *French Legion of Honor*, eight *Artistic Bridge Awards*, the *William Proctor Award* for scientific achievement, the *Townsend Harris Medal* and the *Kimbrough Gold Medal* of the *American Institute of Steel Construction*.

An opponent of specialization in engineering curricula, Dr. Steinman abhors the prevailing shortage of engineers and the lack of a broad liberal foundation upon which a student in engineering may build his courses. He believes, "the engineer should take the position of a cultured professional—a leader of men." The *David B. Steinman Foundation* was established to further these beliefs through grants to education for research and student aid. A respected authority and a benevolent humanitarian, Dr. Steinman summarizes his feelings toward his profession: "To me engineering has been a succession of inspiring influences, of compelling ambitions, of obstacles overcome and dreams come true. The realization—one after another—of dreams that seemed hopeless leaves me reverent and humble." Indeed, scholar, educator, poet, author, engineer Steinman is a great and gifted man.

Economical Shower Baths For Everyone... with BRADLEY COLUMN SHOWERS

THREE HEIGHTS



Bradley Multi-Person Showers are shipped almost completely assembled, thus save installation time and expense. One Bradley Column provides up to 5 showers with each bather having complete control of water volume and temperature.

Thus for 5 showers, there is only *one* set of piping connections—not 5. Each Column has a large base casting securely located in floor serving both as anchor and drain.

Bradley Columns are now furnished in stainless steel as well as in steel with vitreous or baked enamel in white and six beautiful colors: sky blue, sun tan, mint green, forest green, citrus yellow, and French gray.

For complete specification data, write for Catalog 5601. It is yours for the asking... BRADLEY WASHFOUNTAIN CO., 2357 W. Michigan St., Milwaukee 1, Wisconsin.

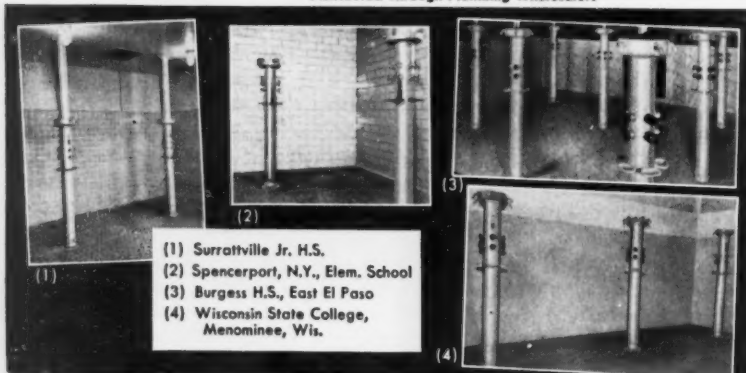


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forecast

(Continued from page 2)

the property plus the closing costs incidental to the transaction.

Under the provisions of Section 203 of the National Housing Act, FHA is authorized to insure mortgage loans up to \$20,000 for as long as 30 years. The interest rate is currently $5\frac{1}{4}$ per cent plus $\frac{1}{2}$ per cent mortgage insurance premium.

In some instances, an older person whose particular housing needs can be met by a small house in a small community or even in the open country may wish to take advantage of a special provision of law known as Section 203 (i) which authorizes the FHA to insure mortgages in amounts up to \$6,650 and up to 95 per cent of appraised value on single family homes in suburban and outlying areas and small communities and on farm homes located on plots of 5 acres or more adjacent to a public highway.

The dwelling must be a complete structure complying with local ordinances and regulations, but it may lack finish flooring, insulation, interior painting, and other such items, at the time the mortgage is insured.

The FHA has [also] revised its trade-in program. By making interim financing more readily available, the plan enables an owner to apply the equity he has built up in his old house as a downpayment on a new one. This means that many older persons now find themselves easily able to finance the purchase of small homes for retirement. Under the law, the individual or firm taking a traded-in property can finance the transaction with an FHA-backed mortgage up to 85 per cent of the amount an owner-occupant can borrow on the same property. The maximum loan permissible on a traded-in property is \$17,000. Only one and two family structures are eligible for this type of interim financing.

Financing private rental housing

... The Housing Act of 1956 added a new provision to the Section 207 FHA rental housing program, to help finance the construction or rehabilitation of rental housing for the elderly by non-profit organizations approved by the FHA. When such an organization will sponsor a rental housing project specially designed for the use and occupancy of older people, a maximum mortgage of \$8,100 per dwelling unit is allowed. This mortgage can be 90 per cent of replacement cost, instead of 90 per cent of value (as required by law for other rental housing under Section 207).

The mortgage may bear a $4\frac{1}{2}$ per cent interest rate plus the $\frac{1}{2}$ per cent mortgage insurance premium and can have a term up to 40 years. Projects can be in

the form of elevator-type structures, row houses, or even separate dwelling units provided they are grouped in a contiguous project and can be for both families and single persons. The mortgage limitation for any one project is \$12.5 million.

Since the program seeks to encourage provision of housing especially suited to the elderly, the statute allows the FHA to permit the full cost of such special features as central dining facilities, reading and recreation rooms, sick bay accommodations, specially designed bathrooms, non-skid floors, special lighting, and the like to be included in the amount of the insured mortgage.

The statute also introduces a new concept regarding the evaluation of the financial soundness of such projects. Instead of having to be judged on a basis of their "economic soundness," projects are evaluated in terms of the financial soundness of the sponsoring group. In other words, projects need not charge rents which cover full operating costs so long as the sponsors are willing and able to absorb operating deficits themselves. [The FHA has set up criteria for judging project sponsors.]

Public low-rent housing

While the 1956 amendments to the National Housing Act should provide private housing for a large segment of the home seekers among our older citizens, there are those who simply cannot afford to pay full economic rents.

... In the past, one of the biggest obstacles facing low-income older persons was the fact that single individuals were not eligible for admission to low-rent public housing. As a result, widows and widowers and other single persons of low incomes were denied the benefits of public housing. To eliminate this obvious injustice, the Housing Act of 1956 amended the public housing law—the U.S. Housing Act of 1937—to open public housing projects to low-income single persons of 65 years of age or over.

Other new provisions of the law specifically authorize the FHA to assist in construction of new housing or remodeling of existing low-rent public housing projects, to provide accommodations designed for older families. For such units, the law provides that cost limits may exceed those for regular units by as much as \$500 per room. [The \$500 increase per room is considered necessary to allow for the additional cost per room in building units for single and two-person occupancy, which units must have substantially the same plumbing and kitchen equipment as units built for large families.]

books

(Continued from page 37)

Machinery's Mathematical Tables edited by Holbrook L. Horton. New York: The Industrial Press, 1958. 254 pp. \$3.75.

Enlarged second edition, 4½" x 7" convenient pocket size. Contains tables for: natural trigonometric functions, logarithms, powers, roots, reciprocals, circumferences and areas of circles, natural logarithms, logarithms of trigonometric functions, English and metric weights and measures, conversion tables and dimensions, areas and volumes of plane and solid geometric figures.

Theory of AC Circuits by Fich, Sylvan and James L. Potter. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1958. 453 pp. \$11.35.

Emphasizes relations between the time and frequency domains. Contains complex numbers and phasor algebra, series and parallel circuits, resonance phenomena, network analysis and others.

Gum Plastics by M. Stafford Thompson. New York: Reinhold Publishing Corp., 1958. 193 pp. illus. \$4.50. Non-technical treatment covers impact-polystyrene polymers, acrylonitrile-butadiene-styrene polymers and impact-rigid polyvinyl chloride polymers for installations in refrigerators, piping and other appliances.

Chamber's Technical Dictionary. Third edition revised, with supplement edited by C. F. Tweney and L. E. C. Hughes. New York: The Macmillan Co., 1958. 1028 pp. \$7.50.

New supplement defines recent terms in nuclear physics, electronics, automation, etc. Revised table of chemical elements included.

Compact Heat Exchangers by W. M. Kays and A. L. London. New York: McGraw-Hill Book Co., Inc., 1958. 168 pp. \$6.00.

Engineering Fluid Mechanics by Charles Jaeger. Translated by P. O. Wolf. New York: St. Martin's Press, 1957. 547 pp. \$11.50.

digest: 9

CONCEPTS OF STRUCTURAL FASTENING OF STEEL/PART TWO

A/E NEWS presents a digest of a paper presented by Richard B. Belford, Technical Representative of the Industrial Fasteners Institute, Cleveland, Ohio, at the Annual Meeting of the Building Research Institute, Pittsburgh, Pa., April 7, 1959.

Features

Suppose we now take a look at some of the features that make the high strength bolt such a desirable fastener for connecting structural steel. It's a well known fact that high strength bolts have strength superiority over rivets. However, until certain research can be completed and independent design rules for bolted joints developed, the Council has officially recommended a straight substitution of a bolt for a rivet of the same size. Using the one-for-one substitution, it will be found that designing within allowable stresses presently permitted by recognized building codes, that applied loads on properly tightened bolted joints are carried completely by friction, not through shear and bearing. Even if loads become excessive enough to bring the bolts into shear, the bolt itself will carry 50 per cent more load than a rivet before failure. In dynamically loaded joints, the fatigue strength of bolted joints at two million cycles is greater than the allowable working stress permitted statically. This means joint fatigue in bolted structures is no longer a consideration. Bolted joints are stronger statically; bolted joints are stronger in fatigue.

A common question is, what happens if the nuts loosen? The answer is simple—nuts, if properly tightened, do not come loose. This fact has been proven time and time again in bolted joints subjected to the severest shock, impact, and vibration loadings. Bolts have stayed tight through years of service in joints where rivets had to be replaced every few months.

Slip reliability

Some engineers, thinking of the 1/16" hole clearance in bolted joints, visualize imminent collapse

of a structure if the joints slip. Viewing the question of slip realistically, the maximum free slip of a bolted joint is limited to the 1/16" hole clearance, and this occurs only when all holes of the joint are perfectly matched. Any misalignment, or mismatching of holes in mating members, will automatically reduce the amount of free slip possible. While slip may be of some concern in bridge design, in long girders, or rigid frame splices, in most building designs, slip is a factor which a practical designer can safely ignore. First, most bolts, just by the nature of the erection routine, will be in bearing before being tightened. Also, full reversal of stress is not a common occurrence in building design, and as mentioned earlier, slip does not occur until the connected members are stressed beyond allowable working loads.

To have a satisfactory joint, bolts must be tightened up to a very high level. The current recommendation is to a minimum of 90 per cent of the bolt's proof load, which in the case of a 7/8" diameter bolt means development of a preload of 32,400 lbs. This is a minimum. There is no recommended maximum, and it is now the accepted practice to tighten bolts well above their yield strength into the plastic range. It's a common misbelief that bolts stressed beyond the yield point become "spongy," and immediately lose all load carrying ability. However, with a heat treated bolt, there is no well defined yield point, and there is no place on the stress-strain curve where, like low carbon steel, there is a sudden "drop of the beam" followed by a period of increase of strain without increase of stress. It has been demonstrated countless times that joints with bolts stressed well into their plastic range perform equally well as joints with bolts

(Continued on page 40)

A/E NEWS DIGEST REPORT: CONCEPTS OF STRUCTURAL FASTENING OF STEEL/PART TWO AIA FILE NO. 13-C

tightened only to the minimum preload requirement. The joints carry as much load statically, have a better fatigue life, and the bolts themselves are not weakened by overtightening.

Installation procedure

High strength bolts are installed by a two-man crew, which can be easily and quickly trained to do a very competent and consistently uniform job. The most popular tightening procedure now being used is based on a turn-of-the-nut method. In this method, the nuts are first tightened to bring the material together, and then are further tightened through one-half to three-quarters of a complete turn. This method is quick, effective, and simple. No impact wrench calibration is necessary, nor is torque measurement involved.

Inspection

Bolted joints lend themselves to easy and economical inspection. The inspector's first responsibility is to make sure the proper bolts and nuts are being used, which he quickly does by visual inspection of the head and nut marking. The inspector should then satisfy himself that the tightening procedure used by the erector will tighten the nuts to the consistently high level desired. Inspection of assembled joints can be visual, as nuts which have been properly tightened have the wrenching faces slightly scored. An occasional spot check with a torque wrench will usually complete the inspection procedure.

Future development

Now, briefly, a peek into the future. The *Research Council* is planning a revision of its assembly specification for issue one year from now. It's expected this revision will include design information which will recognize the strength superiority of bolted joints over riveted joints, and consequently, permit in certain types of joints a reduction in either the size or number of bolts needed to carry equivalent loads. The *Council* is also investigating some new styles of high strength fasteners, which may lead to the elimination of one or both of the hardened washers. Shop bolting is gaining in popularity, and with each new economy introduced, conversion to shop bolting will gain momentum. New proprietary items are being studied, and as they prove out, technical information on their use will be released.

All fasteners discussed so far are standard and non-proprietary in design, manufacture or ap-

plication. However, commercially available are a few special type structural fasteners, each of which has certain merits which may suit it ideally to a particular application. Two such types of fasteners are worth a brief review.

The first, the *Rib Bolt*, or *Rivet Bolt* as it's also known, is basically a combination of a rivet and an unfinished bolt. It consists of a standard rivet button head, a shank, axially-ribbed throughout its grip length, and either a *Dardalet* locking thread with nut, or a standard coarse thread with a locknut. As the bolt is hammered into the hole, the ribs either cut into the walls, or are squeezed down, in either case a body bound fit is developed. Strengthwise, the rib bolt is equal to a rivet of the same size. Unskilled labor may be used, joint slippage is prevented, and use of rib bolts offers reasonable economy. Possible drawbacks are difficulty of driving the bolts, need to ream mismatched holes, and notch effect of rib embedment which may effect the joint's fatigue life.

The second fastener is the high strength bearing bolt which was first introduced just a few months ago. It's a three-piece fastener, a special bolt, a standard heavy nut, and one hardened washer for use under the nut. The bolt is basically a high strength bolt with the addition of the body-bound feature of the rib bolt. It has a button head, a spirally knurled shank, and standard coarse thread. The knurls are specially formed, having a rounded face on the entry side, with a buttress shape on the back. As the bolt is forced into the hole, the knurls press circular-bottom grooves into the walls of the hole, and this cold working of the plate material tends to offset adverse notch effects. Strengthwise, in comparison with high strength bolts, bearing bolts are slightly superior in statically loaded joints, and will perform equally well in connections subjected to dynamic loads. Other advantages are prevention of joint slippage, one-man installation if necessary, and easier handling because of the elimination of the washer under the head. Disadvantages are the need for reasonably good hole alignment, possibly more field reaming, and need for greater erection clearances.

These, then, are the structural fasteners available—rivet, unfinished bolt, high strength bolt, rib bolt and high strength bearing bolt. Each has its own merits; its own limitations. An appreciation of where, when, and how to use each to take full advantage of its best properties will permit the greatest economy without sacrifice of safety, strength or dependability.

index

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calendar

September STRUCTURES BY RICHARD BUCKMINSTER FULLER: first New York exhibition of actual structures by the engineer-mathematician, Museum of Modern Art, New York City.

21-25 INTERNATIONAL COUNCIL FOR BUILDING RESEARCH STUDIES AND DOCUMENTATION, International Congress, of Rotterdam, Holland.

22-23 AMERICAN INST OF ARCHITECTS: north central states regional conference, Milwaukee, Wisc.

22-27 INTERNATIONAL UNION OF ARCHITECTS, sixth annual assembly, Lisbon, Portugal.

27-30 AMERICAN INST. OF CHEMICAL ENGRS: St. Paul Hotel, St. Paul, Minn.

27-30 AMERICAN SOC OF ARCHITECTURAL HARDWARE CONSULTANTS and NATIONAL BUILDERS HARDWARE ASSN: convention and exhibit, New Orleans, La.

30-2 PRODUCERS' COUNCIL, annual convention, Chase-Park Plaza Hotel, St. Louis, Mo.

Oct. 5-30 INTER-AMERICAN HOUSING AND PLANNING CENTER OF THE ORGANIZATION OF AMERICAN STATES: seminar on urban planning, Bogota, Colombia, S. A.

8-10 NEW YORK STATE ASSN OF ARCHITECTS: annual convention, Whiteface Inn, Lake Placid, N. Y.

8-10 AMERICAN INST OF ARCHITECTS, northwest regional conference, Spokane, Wash.

11-16 AMERICAN SOC FOR TESTING MATERIALS: third Pacific area national meeting, San Francisco, Calif.

13 FOURTH ANNUAL ARCHITECT'S TOUR OF JAPAN. Contact Kenneth M. Nishimoto, AIA, 263 South Los Robles Ave., Pasadena, Calif.

14-16 TEXAS SOC OF ARCHITECTS: annual convention, Austin, Texas.

19-23 AMERICAN SOC OF CIVIL ENGRS: annual convention, Hotel Statler-Hilton, New York City.



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